This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

This One
EGDK-8YP-S79F

THE LIBRARY OF CONGRESS

THE

QUARTERLY

JOURNAL OF AGRICULTURE.

VOL. IX.

JUNE 1838—MARCH 1839.

WILLIAM BLACKWOOD & SONS, EDINBURGH;
AND T. CADELL, STRAND, LONDON.
MDCCCXXXIX.

S
.J8

PRINTED BY NEILL & CO., OLD FISHMARKET, EDINBURGH.

CONTENTS.

I. On Insects most injurious to Vegetables and Animals, and the means best calculated to counteract their ravages,—No. 3. By James Duncan, M. W. S. &c. . . . . . . Page 1

II. Water, its Uses and Abuses, and Tanks, . . . 19

III. A Domestic Rabbit-Warren, ... 30

IV. On Hay-making. By Mr Towers, C. M. H. S. . . 35

V. On the Diseases incident to the most usually Cultivated Plants, No. 3, Smut. By George W. Johnson, Esq., Corresponding Member of the Maryland Horticultural Society, &c. 45

VI. Arboretum Britannicum, ... 55

Arboretum Britannicum, or the Hardy Trees of Britain, Native, and Foreign, pictorially and botanically delineated, and scientifically and popularly described, with their Propagation, Culture, Management, and Uses in the Arts, in useful and ornamental plantations, and in landscape gardening; preceded by a Historical and Geographical Outline of the Trees and Shrubs of Temperate Climates throughout the World. By J. C. Loudon, F. L. H. G., and Z. S. S. &c. 8vo. London: Longman & Co.

VII. The Agriculturist's Note-Book, No. III. 64

1. Improvements in Thrashing Machines, 64.—2. Railways and Agriculture, 68.—3. Earthing up of Potatoes, 77.—4. Theory of the Potato Failure, 78.—5. Coffee, 80.—6. Artificial Dressing and Feeding of Tups for Sale, 87.—7. Ægrostis segetum; by Mr Towers, 89.—8. Kohl Rabi; by Mr Towers, 93.—9. Lucern and Saintfoin; by Mr Towers, 95.—10. Abuses of Bone Manure, 99.—11. Extended use of Machines for Sowing Grain, 103.—12. Strictures on Potato Culture; by Mr James Balden, Forester to Lord Blantyre, Lennoxlove, East Lothian, 106.—13. English Agricultural Society, 110.—14. Destruction of Shrubs, 114.—15. The Grinding Bill, 114.—16. Corn Laws, ... 118

VII. Stable Economy, ... 11

Stable Economy; A Treatise on the Management of Horses, in relation to Stabling, Grooming, Breeding, and Working. By J. Stewart, Veterinary Surgeon, and Professor of Veterinary Medicine in the Andersonian University, Glasgow. W. Blackwood and Sons, Edinburgh; and T. Cadell, London. 1838.

IX. Agricultural Chemistry. By Mr Henry Madden, Edinburgh, 12

X. Retrospect of the British and Foreign Corn Trade for Crop 1837. By Mr William Gray Fearnside, London, . . . 13

XI. Quarterly Agricultural Report, ... 15

XII. Tables of the Prices of Grain, Butcher Meat, and Wool; of the Monthly Returns of Foreign Corn, the Revenue, &c. . . 15

XIII. Fiar Prices of the different Counties of Scotland for Crop and Year 1837, by the Imperial Measure, ... 15

XIV. On the Causes of the late Destitution of Food in the Highlands and Islands of Scotland in the years 1836 and 1837. By Mr Alexander Macgregor, Licentiate of the Church of Scotland, Manse of Kilmuir, Skye, ... 15

XV. On the Agriculture of the County of Roscommon, in Ireland, 20

XVI. Thoughts on Draining, as a subject of compact betwixt Landlord and Tenant, ... 22

XVII. Agricultural Chemistry. No. II. By Henry R. Madden, Esq., L. R. C. S., Edinburgh, ... 22

XVIII. On Measuring Growing Timber. By Mr William Blackadder, Land and Timber Surveyor, Glammis, Forfarshire, . . 24

XIX. On the Diseases incidental to our most usually cultivated Plants. No. V.—Rust or Mildew. By George W. Johnson, Esq., Corresponding Member of the Maryland Horticultural Society, &c. 25

XX. On the Structure of Smut-Balls in Wheat. By Mr John Lawson jun., Elgin, ... 26

XXI. Air, its Uses and Abuses, and Ventilation, . . 27

XXII. The Agriculturist's Note-Book, No. IV. . . 28

1. Smallpox, 283.—2. Barm, or Yeast, 288.—3. Effects of successive Crops of Potatoes—Curl; by Mr James Falconer, Balnakettle, Kincardineshire, 293.—4. Best and safest Wash against Smut, 297.—5. Grease for Wheels and Machinery, 298.—6. Liniment for the galled Backs of Horses, 299.—7. Poa Nervosa, 299.—8. Proper Management of Farm-Yard Manure; by Mr John Pearson, Gardener and Planter to W. L. Childe, Esq., Kinlet, near Bewdley, Worcestershire, 299. —9. Lyon's Treatise on Trees, ... 301

XXIII. Miscellaneous Notices—

1. Proposed New Museum of the Highland and Agricultural Society of Scotland, 305.—2. Manufacture of Cheese from Potatoes, 310.—3. Importation of Cattle into France, 310.—

4. Geese as Barometers, 311.—5. Improvement in Glass, 311. 6. Acoustic Telegraph, 311.—7. Strength of Liquors, 311.—8. Galvanic Telegraph, ... 311

XXIV. Quarterly Agricultural Report,—Foreign Corn, . . 312

XXV. Tables of the Prices of Grain, Butcher Meat, and Wool; of the Monthly Returns of Foreign Corn, the Revenue, &c. . 314

XXVI. Agriculture of Hindostan. No. III. . . . 317

XXVII. The Culture of the Potato. By Mr Towers, C. M. H. S. 337

XXVIII. Studies in Agriculture.—No. III. Weeds—Moss in Lawns and Pastures, ... 353

XXIX. Anatomical Examination of the Wild Ox of Scotland, with Remarks on its Natural History. With a Plate. By Dr Knox, 367

XXX. Remarks on Draining Land, with a Description of the Mole-plough brought from England by his Grace the Duke of Hamilton. By Mr Aiton, Hamilton, ... 388

XXXI. On Insects most injurious to Vegetables and Animals, and the means best calculated to counteract their ravages.—No. IV. Wood-boring Beetles. By James Duncan, M. W. S. . . 394

XXXII. Thoughts on Subsoil-Ploughing, ... 410

XXXIII. Agricultural Chemistry.—No. III. Draining—Paring and Burning—Ploughing and Harrowing—Winter-fallow—Summer-fallow. By Henry R. Madden, Esq., L. R. C.S. Edinburgh . . 421

XXXIV. Account of the Highland and Agricultural Society's Show at Glasgow in 1838, ... 439

XXXV. The Agriculturist's Note-Book. No. V.

1. The Suburban Gardener and Villa Companion; by J. C. Loudon, F. L. S., H. S., &c. 452.—2. Drain-filling Harp, 456. —3. Simple Method of carrying Trees for Transplantation; by William Glencross, Esq. Luxstowe, Liskeard, 457.—4. Insects in provisions, 458.—5. Farmers *versus* Rooks; by James Stuart Menteath, Esq. 464.—6. Effects of Pulverisation; by Mr Robert Arthur, Edinburgh, ... 469

XXXVI. Quarterly Agricultural Report, ... 469

XXXVII. Tables of the Prices of the Revenue, Grain, Butcher, Meat and Wool; of the Monthly Returns of Foreign Corn, &c. . 472

XXXVIII. On the Agriculture of the County of Kilkenny, . 475

XXXIX. On the Diseases incidental to the most usually Cultivated Plants. No. VI. By George W. Johnson, Esq. Corresponding Member of the Maryland Horticultural Society, . . 496

XL. Farmers' Luxuries, ... 503

XLI. On the Ox Tribe in connexion with the White Cattle of the Hamilton and Chillingham Breeds. By the Rev. William Patrick, Hamilton, ... 514

XLII. On the Increase of Pauperism in Scotland, . . 534

Report on the Progress and Present State of Pauperism in Berwickshire; with Suggestions as to the Means of reducing its amount. By George Turnbull, Esq. of Abbey St Bathans, W. S. Edinburgh: Printed by Neill & Co. 1838.

XLIII. Agricultural Chemistry.—No. IV. Organic Manures. By Henry R. Madden, Esq., L. R. C. S. Edinburgh, ... 546

XLIV. On Insects most injurious to Vegetables and Animals, and the means best calculated to counteract their Ravages.—No. V. By James Duncan, M. W. S. 565

XLV.—The Agriculturist's Note-Book. No. VI. . . . 583

1. Home-made Bread, 583.—2. Subsoil Ploughing, 589.—3. Barberry Mildew,—Farm-yard Manure; by Mr John Baker, 595.—4. Italian Ryegrass, 597.—5. Tables of Calculation and Measurement, 599.—6. Corn Law Agitation . . 603

XLVI. Tables of the Monthly Returns of Foreign Corn, Prices of Butcher Meat, the Revenue, &c. 614

INDEX, ... 617

THE

QUARTERLY

JOURNAL OF AGRICULTURE.

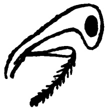
ON INSECTS MOST INJURIOUS TO VEGETABLES AND ANIMALS, AND THE MEANS BEST CALCULATED TO COUNTERACT THEIR RAVAGES.—NO. III.

By James Duncan, M. W. S. &c.

Weevils.—The insects to which this name is applied, form one of the most natural and well-defined groups belonging to that extensive section of their class which is characterized by the possession of hard wing-cases. The head is produced anteriorly into a more or less elongated rostrum or snout, a peculiarity which at once distinguishes them from all other beetles.* This prolongation does not consist of the parts of the mouth, as is the case in flies and other suctorial tribes, but is an extension of the head, having the usual oral organs situate at its extremity. The body is usually more or less arched lengthwise, and in many instances approaches to pear-shaped, with the thicker or hinder end somewhat acuminated; at other times it is nearly cylindrical, narrowed at each end. The external crust is generally very hard, and they are thereby well fitted to resist the injuries to which they would otherwise be exposed from the nature of their haunts, which are frequently among stones and loose earth. Such kinds, however, as exclusively frequent trees and plants, have often a softer integument, and are not unfrequently adorned with very beautiful colours, occasioned by a coating of minute scales. Few of them are much observed on the wing; for, like the majority of the beetle race, they fly but imperfectly; indeed, not a few of the species which confine themselves to the surface of the ground have their wing-cases soldered together at the suture, and are incapable of raising them; in such instances the membranous wings are entirely wanting. Besides the elongation of the head, another very distinctive mark is furnished by the antennæ, which are of a peculiar structure. They are inserted on the rostrum,—commonly consist of eleven joints, of which the radical one is nearly as long as all the rest taken together, and is received into an oblique groove on the side of the rostrum. The articulated portion, which is clavate at the apex, usually forms a right angle with this stalk or elongated radical joint, so that, when the antennæ are extended, they present the appearance of a trident, of which the rostrum forms the central prong. (Fig. 1. head, rostrum, and one of the antennæ.)

---

* A tendency to this structure appears in some allied races, such as the *Bostricidæ* and *Bruchidæ*; but it is so rudimentary, that they are not likely to be confounded with the rostrated beetles, properly so called. Individuals destructive to vegetables occur in both the tribes just named, and they will therefore require to be described hereafter.


1

2

4

3

5

These insects composed the genus *Curculio* of Linnæus; but, as they are very numerous, and exhibit almost endless modifications in form and structure, modern naturalists have found it necessary to subdivide them into a multitude of genera. Not fewer than five hundred different species have been described as inhabiting Britain. Both in the larva and perfect state, they feed exclusively on vegetable substances, principally on herbaceous plants, although no small numbers likewise attach themselves to trees and shrubs. From this statement it may naturally be anticipated that our cultivated vegetables are not exempted from their attacks; and they are in fact found to be very formidable enemies both to the farmer and horticulturist. The larvæ of certain kinds are subterranean, and, consequently, consume roots; others destroy the flowers of fruit-trees; and some feed upon seeds, while the perfect insects mutilate the leaves. We doubtless sustain injury from many species, with the general history of which we are yet unacquainted. The following notices include those whose habits have been in some measure investigated.

Calandra granaria.—The extensive devastations of this, the *grain-weevil*, as it is called *par excellence*, have obtained for it a kind of bad eminence among its compeers, and caused its habits to be investigated with considerable attention. Several circumstantial accounts of it have accordingly been published; but we cannot, for that reason, omit to include a resumé of its history in a general notice of the insects destructive to vegetable produce, more especially since the best of these accounts are in a foreign language, and in works not readily accessible to the general reader.* It is the only species of the genus *Calandra* that can properly be considered a native of this country, and presents the following generic peculiarities:—Antennæ scarcely longer than the head and rostrum, inserted near the base of the latter, nine-jointed,—the elongated radical joint, when bent backwards, reaching to the thorax,—six following short,—the remainder forming a narrow, somewhat ovate club, the apex of which is spongy; rostrum rather long; thorax elongate, a little narrowed in front; elytra scarcely longer than the thorax, and not quite covering the abdomen; legs rather short. The species in question is nearly two lines in length; of a brown or pitchy colour when mature, but pale on first emerging from the pupa; the thorax is nearly as long as the elytra, rather depressed above, and covered with large oblong punctures; elytra scarcely so wide as the thorax at their base, the surface marked with deep lines faintly punctured in the bottom; under side of the body also punctured; legs rusty red.

This insect frequents granaries and other repositories of corn, where the female buries herself in the heaps, and depo-

---

* De Geer's *Mem. pour servir*, &c., and articles in the *Dict. Class. d'Hist. Nat.*, tom. iii., and *Journal de Physique*, t. lxxxix, are principally alluded to. A pretty full account, chiefly derived from these sources, may be found in Griffith's Cuvier, vol. xv. 72. The figures of the insect in Rennie's (Insect Trans. p. 234), and some other popular works, are so inaccurate as to be likely to mislead the observer who has no other means of information.

sites her eggs in the grain. For this purpose she makes a small hole with her rostrum in the skin of the grain in an oblique direction, and, after having placed an egg in it, closes the aperture by means of a glutinous matter. Never more than one egg is consigned to a single grain, as the whole of the substance of the interior is insufficient for the support of more than one larva. The latter is hatched in a longer or shorter time, according to the temperature, but usually after a few days. It is a small vermiform creature, of a white colour, and about a line in length, composed of nine segments, the body soft, but the head of a harder consistency, in order to afford sufficient support to a pair of strong jaws, which are the only external organs it has either space or apparent inclination to employ. With these it erodes the farinaceous substance of the grain, continually enlarging its dwelling as it continues to increase in size; and by the time that the whole of the interior is scooped out, it is prepared to assume a different form when food is no longer necessary. The pupa into which it now changes is also white, somewhat transparent, and lies like the kernel of a nut within its shell, the latter being formed by the exterior envelope of the grain. When the perfect insect is matured, it makes its escape by gnawing a hole in the walls of its tenement.

The period when these changes take place, and the duration of each successive state, are greatly influenced by the temperature. In the south of France, for example, the female commences laying in the month of April, and the insects continue to propagate till September. In this country they increase rapidly only during the warmer months of summer. As might naturally be expected in such circumstances, the geographical distribution of the *Calandræ* is likewise dependent on temperature; they occur in profusion in the south of France, and similar latitudes in Europe; are likewise too abundant in London and the southern districts of England, but gradually become less plentiful as we advance northward. We believe that they seldom occasion any serious damage in Scotland. On an average, it may be stated, that from forty to forty-five days elapse from the union of the sexes till the evolution of the perfect beetle, the greatest proportion of which is spent in the larva state. From the number of eggs laid by a single female, it has been calculated that her descendants may amount, in a single season, to 23,600 individuals; a degree of fecundity which may enable us to judge of the evil they are calculated to produce when their numbers, in the first instance, are considerable.

Although the larva is of course the principal cause of this injury, the perfect insects take likewise a direct share in it, by gnawing the grains. It has, indeed, been denied by some observers, that they ever do this, except when making an opening for the admission of the egg ; but it is utterly improbable that they should, for such a length of time, frequent places where they can have access to no other kind of food, without using the grain as such. In this condition, however, probably very little food suffices, and the injury done consists rather in the frequent breaking of the skin of the grain, than in the actual quantity of its substance consumed.

The grain into which this insidious foe has been so expertly introduced, presents no external appearance of being unsound, but when immersed in water, it floats on the surface, a circumstance which intimates that the farina has been destroyed. When this is the case, the infected particles should be removed, if possible, from the heap, and the enclosed beetles killed. But in an extensive granary, this is obviously no easy task, and the loss arising from the insects will not, in many instances, greatly exceed the trouble and expense incurred by any means of separation that has yet been employed. If the damaged grain, however, be so much lighter as the above-mentioned circumstance seems to indicate, it appears probable that if the whole were passed through a winnowing machine, it would be thrown out in the same manner as the chaff and light corn are in an ordinary case. If this operation were found to answer the purpose, it could be more easily carried into effect than any other plan that has been recommended. That of exposing the corn to heat, is liable to this objection, that before the eggs or larvæ could be destroyed, the temperature would require to be so high that it would dry the corn too much, and even calcine it.

The principal object ought to be the destruction of the beetles before they have had time to lay their eggs; after that operation is accomplished, they speedily die of their own accord. Of the various schemes that have been proposed for this purpose, the following is the most approved. When the individuals that have passed the winter in a torpid state, are beginning to recover their activity, and to move about among the grain, a small heap, composed of that kind of corn to which they are most partial (which is said to be barley), should be placed at a small distance from the principal store. The latter should then be turned over, and tossed about as much as possible, at intervals, that the weevils may be fairly disturbed and put in motion. Naturally very fond of quiet, and anxious to escape from such unceremonious treatment, they take refuge in the undisturbed heap placed as a decoy. When collected there in numbers, they are speedily incapacitated for further mischief by having boiling water poured over them in such quantities as completely to saturate the heap. Such individuals as escape to the walls or elsewhere, may be swept together by a broom, and easily disposed of. The corn of the decoy-heap may afterwards be separated from the dead insects by sifting. Even though this plan may appear not to promise much in the recital, it is affirmed that, in practice, it has been attended with highly favourable results.

As these creatures do not propagate except at a pretty high temperature, attempts have been made to check their increase by keeping that below the requisite degree. The only means employed for this purpose is free ventilation; but this must necessarily prove inefficient; for it is obviously impossible, in the summer months, thereby to effect such a reduction as is at all likely to influence their economy. More might be expected from mixing the corn with quick lime, sulphur, or some other substance which seems fitted to disgust them; but this could only be done with grain designed to be used as seed; for the taint they are likely to communicate, render such applications inexpedient when it is to be employed for other purposes.

Anthonomus Pomorum.—This genus is so named on account of the species feeding, in their larva state, on the blossoms of trees and shrubs. Owing to the length and slenderness of the rostrum, and the short broad body, they have rather a peculiar appearance, which renders it unlikely that they will be confounded with any other of the weevil tribe, except a few allied genera, which are sufficiently distinguished by subordinate characters. The rostrum is at least half the length of the body, and very slender; antennæ inserted near the middle, 12-jointed, the four terminal joints forming a long acuminated club; thorax somewhat conical, much narrowed in front; elytra broad, widening behind; legs long, the thighs very thick. The species above named, of which we are now to give some account, is about two lines long, of a pitchy-red colour, more or less obscure, with short ash-grey hairs scattered over the body. The head is blackish, punctured, and has an impression between the eyes; rostrum faintly punctured; antennæ reddish; thorax thickly punctured in the centre, and marked with three faint lines, composed of short ash-grey hairs; scutellum white; elytra with punctured lines, each having an oblique stripe behind the middle formed of white pubescence, appearing as if drawn with chalk; these stripes meet at the suture, and form a kind of V. The legs are reddish, the thighs nearly black in the middle, the anterior pair armed with a large and strong tooth beneath.

As the specific name implies, this weevil infests apple trees, and has been long known as a formidable pest in gardens and orchards, particularly in the cider counties, where the cultivation of the apple is a matter of more than usual importance. The beetle hybernates beneath lichens and the bark of trees, and we have frequently found it in situations where it must have been almost wholly exposed to the severity of the season. It begins to move about pretty early in spring. "With the first sunshiny day in March" (usually much later in Scotland), "they leave their winter quarters, crawl up the trunk and along the twigs, perch themselves so as to receive the full benefit of the sun's rays, and plume themselves with their legs and feet all over, trident and all, just in the same manner that a cat washes her face with her paw; they then stretch out one leg at a time, cramped no doubt by the long confinement; they then lift up their wing-cases, and unfold two large transparent wings, which, though twice as long as the wing-cases, were neatly folded up and hidden under them, and then, launching themselves into the air, they go roving about the orchards and gardens, their little hearts in an ecstacy of freedom, and love, and happiness. It is not long before each finds a suitable mate; no relations raise objections; and the nuptials are consummated."—(*Rusticus in Entom. Mag.* i. 35.)

The next care of the female is to find a suitable nidus for her future offspring, and for this purpose she selects the flower-buds of the apple-tree, which, by the time she requires them, are fully developed, or just beginning to expand. With her long auger-like proboscis (longer in this than in the opposite sex, probably for the express purpose), she pierces a hole in the calyx of the flower-buds deep enough to penetrate into the interior. When this is completed so as to answer her purpose, she turns the extremity of her abdomen towards the hole, and slowly insinuates into it a pretty long flexible tube, which she has the power of protruding at will from behind. This is the ovipositor, which, being composed of a series of cylinders sliding into each other, like the tubes of a telescope, forms a canal for conveying the egg in safety to its appropriate receptacle. It is not long till the perforation grow up, and the egg is thus secured on all sides from the weather, the bills of small birds, and any other ordinary danger. It soon produces a small white grub, similar in form to the larvæ of other long-snouted weevils, which devours all the interior parts of the flower, the stamens, germen, and receptacle. Thus rendered incapable of producing fruit, and the health of the bud greatly injured, it soon ceases to grow, and while the untainted blossoms are expanding their delicately tinted petals to the bland airs of spring, it continues folded up, or but partially opened, and ere long changes into a sickly brown colour, the precursor of a speedy decay. Meanwhile, the little occupant is advancing to maturity, unmindful of the blight it has occasioned. When full-grown, it changes to a pupa, which, after a period of dormancy, produces the full-grown insect prepared, in due season, to go through the same series of operations that have been described.

As it seems improbable that any means of destroying the egg or grub, ensconced as they are in the heart of the bud, can be employed without damaging the latter, preventive measures should be principally directed against the perfect insects. Whatever plan can be adopted for killing them during the winter, when they lurk about the fissures of the bark, will be attended with little risk of injuring the buds and young shoots, which is far from being the case at other seasons. The method described by Harrison, in his "Treatise on the Culture and Management of Fruit-trees," may be followed with great advantage, not only in ridding them of this enemy, but of every other of a similar description which hybernates about the bark and in the adjoining walls. His practice was, to have the wall trees entirely loosened from the wall every year at the time of the winter pruning, and to brush both the tree and wall with a common hand-brush. Such of the walls as had been covered with paint, coal-tar, or other means, require that all the places made bare by pulling out the nails, &c. should be recoloured previously to anointing the tree with a composition prepared for the purpose; but whether the wall be coloured or not, after it is swept clean it should be well washed with urine, applying it with a brush, care being taken that as little as possible fall on the trees, because it is injurious to them. He asserts that this treatment is destructive to insects and their larvæ, especially when followed up by the application of a composition, to be prepared according to the following receipt:—To four gallons of water add one pound of soft soap, two pounds of common sulphur, two ounces of tobacco, and one ounce of black pepper; some think this preparation improved by the addition of one gill of train-oil. This should be laid on in a tepid state, by means of a brush, taking care to draw the brush up the shoots so as not to damage the buds; it should be well rubbed in at the angles and sinuosities of the branches. It can be applied with equal ease to espalier and standard trees, and is said to be beneficial not only in removing insects, but in clearing the bark of lichens, mosses, byssi, &c. and thereby promoting their general healthiness. The expense is trifling, the quantity requisite for washing a large tree not exceeding 3d. When the bark is rubbed, it is advisable either to lay a cloth on the ground beneath to receive such insects as may be displaced, or afterwards to rake the surface of the soil together, and pour some liquid over it to kill them, not leaving this, as is often done, to the chance of being effected by the cold.*

Finely pulverized quicklime has also been successfully used not only against this, but almost every other insect assailant to which fruit-trees are exposed. This substance, indeed, may be said to be at once the most accessible, efficacious, and generally applicable remedy that has yet been used in preserving plants from the attacks of insects, and it has this additional advantage, that, notwithstanding its caustic properties, it does not injure the most delicate foliage. It should be applied, in the present case, while the morning dew is on the trees, or when they have been otherwise moistened. It would probably deter the weevil from gnawing the flower-buds. To render its application easy, an individual, who considers himself indebted to it for the safety of his crops, has described a duster which he was accustomed to employ. It is a kind of cannister, 12 inches long, 7 inches wide at its broadest, and 4 at its narrowest part; the handle 5½ inches long; the top of the handle fitted with a cap, which is put on when the lime is to be thrown on low trees, but when high trees are to be operated upon, the cap is removed, and a pole of sufficient length inserted into the handle.—(Mr S. Curtis, in *Trans. Hort. Soc.* vi. 124.)

Another weevil, of a different genus from the above, likewise frequents apple-trees, and is frequently alluded to by horticultural writers on account of the injury it occasions. This is named *Phyllobius Mali.* Its economy is probably similar to that of *A. pomorum*, although no detailed account of it has yet been given. Judging from the habits of others of the same genus, it is likely that the grub, when full fed, allows itself to drop to the ground, and undergoes its final metamorphosis in the soil. The insect is very common in all parts of the country. The following description will enable it to be recognised: Rostrum about the length of the head, and only a little narrower, somewhat thickened at the apex, which is deeply notched; the antennæ inserted before the middle, the club 4 jointed; colour of the body blackish when rubbed bare, but entirely covered with narrow hair-like scales, which are greyish, and changing with the light into bright coppery red; scutellum (a small triangular space at the base of the wing-cases exactly in the centre) white; elytra rather ample, scarcely twice the breadth of the thorax, marked with parallel punctured lines; underside of the body black, with scales of a metallic lustre; legs and antennæ reddish, the thighs with an acute tooth beneath; length from three to three and a half lines. The genus Phyllobius contains about a dozen British species, a considerable proportion of which have been ascertained to inhabit Scotland. Many of them are very beautiful insects, being covered with minute scales of a very brilliant green.

---

* Gardeners are apt to trust too much to the action of cold for destroying insects, misled by observing its influence on animals of higher organization. Many kinds of larvæ can bear to be frozen into a solid piece with perfect impunity, and numerous beetles hybernate in places where they are subjected to all the rigours of winter. When in Boothia, Captain Ross exposed the caterpillars of a moth (*Laria Rossii*) to the winter temperature of that hyperborean climate for three months, and on being brought into the cabin they all revived and walked about. They were again exposed to an atmosphere of 40° *below zero*, and instantly became refrozen; but, after continuing in that state for a week, nearly all of them recovered: even after the experiment had been four times repeated, some of them still survived.

Balaninus nucum.—This is the systematic name of the nut-weevil, which has been long classed among noxious insects for the disappointment it often occasions to the grower of nuts and filberts. The generic name is from a Greek word signifying an acorn, one of the species taking up its abode in the fruit of the oak. In its essential characters this group is very intimately connected with that just described under the name of Anthonomus. The proboscis, however, is even longer, equalling the dimensions of the whole body, very slender, and a good deal arched; the antennæ 12-jointed, the radical joint reaching to the eyes, the club ovate, and composed of four joints. The elytra, when united, are somewhat heart-shaped or triangular, the shoulders being prominent, and the hinder portion attenuated. The legs are rather long; the thighs clavate. The species now under consideration is described by Mr Stephens as follows:—(See figs. 2 and 3 of the preceding cut.)

"Slightly depressed, black, densely clothed with flavescent or griseous pubescence, with deeper shades and irregular fasciæ; head furnished with a very long and slender rostrum, which is outwardly rufous; thorax subcarinated; scutellum flavescent or whitish; elytra (not covering the extremity of the abdomen) punctate-striated, the interstices thickly rugulose; body beneath also pubescent, with the pubescence very dense on the anterior angles of the breast; legs dull ferruginous, the joints somewhat piceous: femora acutely dentate; antennæ dull ferruginous. Length 3–5 lines."—(Illust. of Brit. Entom. vol. iv. *Mandibulata.*)

With her long polished beak the female (fig. 2.), when about to lay her eggs, drills a hole in the nut, and by means of her ovipositor introduces an egg into the interior, in the same manner as the apple-weevil does with the flower-buds. This usually takes place in the early part of August, when the nut is soft and immature. The larva (fig. 4.) is hatched in about a fortnight, and continues to reside in the nut, and to feed on the kernel and surrounding pulp. It is short, thick, and fleshy, and when at rest keeps its body curved into a semicircle. It is entirely without hairs and bristles, but is thickly covered with small tubercular elevations. It has neither apparent eyes nor legs. Its change into a beetle never takes place, as has often been supposed, within the nut, for when full grown it makes its escape either by the hole through which it was introduced, enlarged for the purpose, or by another which it cuts out with its mandibles. It then secretes itself in the earth, and becomes a pupa of a pale colour, with two sharp projecting points at the hinder extremity, and having the head and rostrum distinctly formed, the latter lying along the breast in a manner similar to what may be seen very conspicuously in the chrysalides of hawk-moths (*Sphingidæ*); (fig. 5).

Perhaps the best method of destroying these weevils is to collect them from the bushes in the end of July and beginning of August, when they are actively running about in search of a suitable nidus for their eggs. This may be most easily accomplished by shaking the bushes or beating them with a pole, while either an insect-net is held below to receive them as they fall, or, what would be preferable, a sheet spread on the ground. The insect is abundant in some parts of England and on the Continent; but it is scarce in Scotland, and in the latter country the nut is never an article of such commercial value as to render its preservation a matter of much importance.*

Otiorhynchus sulcatus.—In this instance the generic name, which literally means *ear-beaked*, bears allusion to a minute projection on each side of the rostrum, near the apex, which has a faint resemblance to an ear. The rostrum is rather short and thick, widened at the apex, and having a short groove on each side for receiving the basal joint of the antennæ. The latter are inserted towards the apex of the rostrum, are about half the length of the body, and 12-jointed, the first joint reaching to the anterior edge of the thorax, the four last forming an oblong, acuminated, and very narrow club. The thorax is rounded on the sides and convex above; the abdomen ovate, or oblong-ovate, covered with strong wing-cases, which are united at the dorsal suture. The thighs are strongly clavate. From those details of structure (which in this and some other instances may perhaps appear tediously minute, although they have been studiously limited to such as may barely suffice for discriminating the different groups), the members of this genus may be distinguished from their associates. They are insects about the middle size, and rather elegant in their forms and proportions. They are incapable of flight in consequence of the junction of the wing-cases, and are usually found in the earth or beneath stones. Many of the species are abundant in cultivated lands, and it is probable that they cause the decay of many useful plants, for the larvæ live in the earth and eat the roots. The species above named, the metamorphoses of which have been lately traced by Buché and Mr Westwood, is one of the largest, measuring nearly five lines in length. It is of a brownish-black colour, the elytra rather deeply furrowed (whence the specific name), and marked with small scattered tufts of yellowish hair. The head and proboscis are punctured, and the latter has a wide furrow on its upper side; thorax covered with regular conical tubercles, the tips of which are rounded and somewhat shining, the centre with an indistinct groove; elytra also roughly granular on the surface. The under side and legs are black, with thinly scattered hairs; the thighs with a small tooth beneath near the apex.

---

* In a communication from Mr Wighton, in Loudon's Gardener's Mag. (vol. xiii. 213), it is stated that the nut-weevil had greatly injured the vines at Cossey Hall, the seat of Lord Stafford, by gnawing off the young shoots; and that hundreds were found lurking beneath the bark. But this implies such a departure from the usual habits of this insect, that it is probable some other species has been mistaken for it.

The larva is nearly half an inch long, of a dull whitish colour, thick and fleshy, slightly attenuated at both ends, the surface thinly beset with short bristles. It possesses a pair of strong mandibles, and minute palpi, but the eyes and antennæ are wanting. The sides are covered with fleshy tubercles; and as it is destitute of feet, it moves by the vermicular contraction and elongation of the segments. This grub is for the most part subterranean, but in some instances it is asserted to come out of the ground and attack the tendrils and young shoots of plants, being always most active during the night. It seems to feed on a great variety of roots; so many, indeed, have been mentioned as subject to its attack, that it may be almost regarded as indiscriminate in its choice, but is particularly attached to those of succulent vegetables, and frequently injures cabbage to a considerable extent. It changes beneath the ground into a pupa, not forming any cocoon or covering of flocculent silky matter, as is done by many other weevils. This pupa is oblong, and the integument so thin that the forms of the enclosed insect can be discerned, and when the integument is removed all the parts of the beetle are found to be developed. It continues in the pupal state from 10 to 15 days.

The destruction of these larvæ is attended with the same difficulty that is experienced in regard to all that live beneath the ground. They can only be reached by some liquid, for the places where they usually occur render it impossible to dig up the soil, or adopt means to destroy them otherwise. If they climb up the plants, as they have been asserted to do at times, they may be picked off with the hand, but it being chiefly in the night that they venture to leave their retreats, little good is likely to be effected in this way. The perfect insects, however, may be collected without much difficulty, as they are conspicuous from their size, inactive in their motions, and incapable of escaping by flight. But unless this be done when they first begin to make their appearance, it will, for obvious reasons, be attended with no advantage whatever.

The *O. sulcatus* is a very abundant insect in the gardens about London, and other places in the south of England. It is comparatively scarce in Scotland, although we have observed it occasionally in many places, but several other members of the same genus occur in profusion. This is particularly the case with *O. picipes* (*Curculio vastator* of Marsham), a handsome insect of smaller size than *O. sulcatus.* The habits of the larva have not, as far as we know, been attended to, but they are doubtless similar to those of the species above described. The full-grown weevil is likewise obnoxious, for it ascends the stalks of slender herbaceous plants, and cuts them in two. A correspondent of Mr Westwood states, that a vast number of flowers were once destroyed in this way in the Botanic Garden at Dublin.* These depredations are committed in the night; we have usually observed the insect during the day lying in a kind of dormant state, very often in the axillæ of the leaves and branches of grasses and other plants. This weevil is between three and four lines long, of a pitchy colour, thickly covered with rounded ash-grey and dusky scales. On each of the elytra there are ten rows of ocellated points, consisting of a central scale, surrounded by an impressed circle, the spaces between these rows occupied by a regular series of small tubercles; legs pitchy-red, the thighs with a very obtuse tooth. *O. Ligustici*, a larger insect than either of these, has recently destroyed a great number of vines near Paris. It likewise attacks the young shoots of asparagus.

Apion apricans. The genus Apion derives its name from a Greek word of corresponding orthography, signifying a pear, to which the species bear a considerable resemblance in shape. The antennæ are scarcely or not at all bent in the middle, although the radical joint is, as usual, much longer than the rest; they are sometimes inserted towards the middle, at other times near the base of the rostrum; the latter projects forwards, is slender, elongate, nearly cylindrical, and somewhat curved. The thorax is narrow, conic, or somewhat cylindrical, and the abdomen usually very much dilated, widest at the hinder extremity. The insects to which this definition applies are among the most minute of the weevil tribe; the largest not exceeding two lines and a half, and some of them scarcely measuring one line. The crust is usually very hard, and not unfrequently adorned with rather vivid metallic tints, and sculptured with deep parallel furrows and catenulated lines. It is an extensive group, comprehending about ninety different kinds. These are often extremely difficult to distinguish from the absence of any strongly marked characters, and it is not till after a careful examination with a lens, that the specific peculiarities can be detected. In all their states they feed on vegetables; and many plants have a certain insect appropriated to them, which it never leaves for other food. This is the case, for example, with the restharrow (*Ononis arvensis*), the meadow vetchling (*Lathyrus pratensis*), tufted vetch (*Vicia Cracca*), and many others. By far the greatest proportion are attached to diadelphous plants, next to which the *Malvaceæ* and *Columniferæ* are their favourite food. The common mallow supports several different kinds. It may be supposed that the foliage of plants sustains but little injury from such puny assailants, and in general this may be the case, although we have seen the restharrow almost completely stripped of its leaves by *A. ononis*. The circumstance, however, which renders them most obnoxious, and brings them completely within the scope of our present notices is, that the larvæ, in some instances, feed on the seeds of clover, and in such a case their minute size does not prevent their depredations from assuming a more formidable aspect. Several different species appear to be addicted to this habit, but the most common is that named above, and an account of its economy will afford a knowledge of the proceedings of all the kinds which infest trefoils. It is named *apricans*, because it frequents warm sunny exposures—*locis apricis calidioribus*, as its habitat is described by Fabricius, and is synonymous with the *A. flavifemoratum* described by Mr Kirby in his excellent monograph of the genus.* It may usually be found in some plenty on stones and warm banks by the sides of fields, and seems to occur in all parts of the kingdom. Its length is about a line and a half; colour of the body black; head finely punctured, the space between the eyes wrinkled; rostrum long, filiform, shining, and finely punctured, somewhat thickened in the middle where the antennæ are inserted; the latter black, yellowish at the base. The thorax is thickly punctured, and has a faint impressed line on the back behind; elytra ovate, inclining to globular, somewhat glossy, with a faint brassy tint, impressed with parallel lines of punctures: legs black, the thighs, two anterior coxæ, tibiæ, and all the trochanters, yellowish-red.

---

* London's Gardener's Mag. for April 1837.

---

* Linn. Trans. vol. ix.

The individuals observed in the spring have survived the winter in their perfect state, lurking in a torpid condition beneath the bark of trees, among moss, under stones, &c. During the cold season, many of them are no doubt consumed by small birds, which are then very active in search of insect food. By the time the heads of the red clover (*Trifolium pratense*) are ready to flower, the female apion is prepared to deposite her eggs, which she does on the calyx of the florets, placing them usually near the base. As soon as it is hatched, the larva begins to eat its way through the base of the floret, and consumes the rudiment of the future seed. Having increased in size and acquired greater strength, it proceeds from one seed-vessel to another, subsisting entirely on their contents. This larva is an extremely minute whitish worm, with a black head: it is without legs, its movements being effected by means of three small prominences on each side of the body. When full grown, it changes into a small oval pupa, of a white colour, within the tube of the corolla, where it obtained its food. The skin of this pupa is so transparent, that at an advanced stage the limbs of the enclosed insect can be traced through it. After a short time the perfect insect is disclosed; it is at first soft and white, but soon acquires the colours and properties by which it is ultimately distinguished.

The extent of the injury sometimes committed by this small insect (or another very closely allied to it, for the description is not sufficiently explicit to render the identity of the two quite certain) may be estimated from an account of its depredations given in the Linnean Transactions.* Mr Markwick there states, that, in the year 1798, four acres and a half of common red clover produced 16¾ bushels of seed, which sold for L.41 : 17 : 6; while the same quantity of ground in 1800, produced, owing to the ravages of the weevil, only 7½ bushels, worth, at the same price, L.18, 15s.; thus leaving a deficiency of L.23 : 2 : 6. It is obvious, therefore, that the subject is well worthy of the attention of seed growers, for, in addition to the actual loss, the seed that remains is very often impaired in quality, either by being partially gnawed, or by having been in some degree deprived, by the insect's operations, of the nutritive juices necessary to its perfect development. It is not very easy, however, to suggest a plan either for guarding against the creature's attacks, or checking them when they have actually commenced. The eggs having been once laid, and the larvæ taken up their position in the interior of the heads, it will be alike difficult to dislodge them and to destroy them by any kind of application. It may, however, be found that a sprinkling of some fluid preparation will destroy them without injury to the plants; but it would require to be so plentiful, that the infected heads should be nearly saturated. The destruction of the parent weevils in spring should be attempted; and this would perhaps be best accomplished by brushing the young clover plants, as well as the weeds growing about the hedge bottoms, with a small net composed of some substance with sufficiently small meshes to enable it to retain such minute objects.

---

* Vol. vi. p. 142.

Apion assimile, a species very similar to the above, selects the *Trifolium ochroleucum*; and another, *A. flavipes*, attaches itself to the common Dutch or white clover (*Trifolium repens*). As the latter is a very common insect, those who cultivate the plant just named for its seed should be on their guard against it; and in order that it may be recognised, we shall subjoin a short description. The body is black and shining; rostrum not very long, also black and shining, slightly thickened at the base and apex, the antennæ, which are yellowish at the base, inserted behind its middle: thorax scarcely wider than the head, thickly punctured, and having a short impressed dorsal line behind the middle: elytra ovate, inclining to globose, but not so much inflated as in *A. apricans*, the surface marked with closely-placed punctured lines: legs yellow, the tarsi and coxæ black; the latter parts sometimes yellow on the two anterior pair of legs: length about a line and a quarter.

WATER, ITS USES, ABUSES, AND TANKS.

THE title of this article will, we doubt not, surprise the readers of this Journal. "What have we to do with water, in growing our crops," they may exclaim, "keeping our cattle, improving our farms? We must take the good the gods provide us, and try to be contented with that portion of rain which falls from the clouds, be it much, be it little; in an article on water we can feel no interest." We venture to hope, and believe, that not one of our friends, on the contrary, will be indifferent to the subject, when they shall have perused a page of the article now before them. It is an extraordinary circumstance, that in a country so rich in her landed interest as Great Britain—so enterprising, so fertile in expedients, so provident, calculating, and so alive to every advantage, as are her subjects generally—there should exist a defect so glaring, an oversight so obvious, as the abuse of one of the greatest and most essential blessings beneath the sun; and the neglect to harvest the produce of the atmosphere as we do the products of the earth. The waste of water, of rain-water, the purest of all, is prodigious; the sufferings for want of it, particularly during the three last summers, afflicting (to say nothing of the late tremendous winter); yet not the least attempt is made to economise, or "garner up," the treasure, when again bountiful Nature restores to us her noble gift in lavish profusion. Extraordinary that our deprivations should not, have instructed us in a method to obviate them!

The climate of England has long been "a bye word and a jest," and has furnished a topic for idle and querulous vituperation, ever since her discontented inhabitants have been able to read of the "sunny skies of Italy." We incline to think, on the contrary, that our clime—made up as it is of every country's worst and best—is one of the finest, if not the very finest, in the world. "Where much is given, much shall be required;" it is for us, her highly endowed denizens, to exert our faculties, our capabilities, our gratitude, and prove that we have the skill and the will to appreciate our mercies, and turn them to the best account.

Who that is blest with observation, but must be grieved, on passing a farm, whether of large or confined dimensions, to observe, during a heavy fall of rain, the eaves of every outhouse dripping away gallons, nay hogsheads, of that pure and salubrious fluid, to create a worthless puddle, which would, if saved by the providence of its owner, render the arid heats of summer comparatively blissful to the live-stock of his homestead? What forethought can ensure us a knowledge of the weather for a future season? Not the prescience of the weather prophets, based as their prognostications may be upon a knowledge of the combinations of that master machinery of the universe, magnetism and electricity! The experience of the last three summers ought to warn us against the error of trusting to our "weeping clime" to ensure a sufficient supply of rain. Let us rather guard against the sufferings and privations endured in either heat or frost, by storing a portion of the abundant supply that is beneficently vouchsafed to us.

It is not our intention to enter into a chemical analysis of water; but, preparatory to commencing the principal subject of this paper,—the utility of tanks, with the method and cost of building them,—we would point out a few of the advantages which rain-water possesses, for many purposes, over that of wells and springs. Water which percolates through the earth to a considerable depth, and is thence drawn up to the surface, holds in solution several substances that are inimical to health, as well as totally preventive of some of the uses to which water is applied. In a chalky district, this fluid is rendered insalubrious by the presence of that prevailing mineral, chalk. In many stony soils it is a frequent and injurious substance, and is also called carbonate of lime; this is the chief cause, in fact, of the hardness of the water in our springs and wells. By precipitating the lime, we liberate carbonic acid gas, and this may be effected in two or three ways, either by boiling (which, on a large scale, is very inconvenient), or by adding more lime to the water, when the extra portion will deprive the water of its carbonic acid, and thus both portions of lime will be precipitated; a third method, though more expensive than the others, is by the addition of an alkali, either soda or pearl-ash. For usual domestic purposes, where no soap is required, such as mopping dairy floors, washing vegetables, &c., the hard-water of a well may be used without disadvantage; but for watering plants of any description, either in a garden or conservatory, such water is highly injurious; and it is therefore requisite to expose it for a length of time to the action of the atmosphere, which will tend to soften it: indeed this property of the air is exemplified on a large scale in the superiority of river water over that of springs and wells; for, if rain form the chief supply of a large river, it is not by means of that portion which falls from the clouds immediately above it; but the rain of a whole district, which, on mixing with the different soils on which it descends, imbibes their various substances, holds and carries them in solution to the main stream, there to be ameliorated by the decomposing action of the atmosphere.

For the purposes of the laundry, well and spring water are almost invariably inapplicable; and even when softened by thrifty laundresses with wood-ashes, sifted from the consumed fuel of the weekly baking, or by means of pearl-ashes, is still harsh, and inefficient in its cleansing properties.

Well-water is unwholesome to drink, where this pernicious carbonate of lime abounds; and therefore, before it is used for the usual social meals, breakfast and tea, it should be exposed to the action of ebullition for a considerable time; the vast calcareous deposit that will quickly be observable in the boiler, will convince all who wish to investigate the result, that it is by no means desirable for the human frame to be the recipient of matters so extraneous. Well-water, however, *thus prepared*, we decidedly prefer, for the purpose of the tea-table, to the comparatively pure and innocent rain-water; there is a vapidity, a want of spirit, in the latter, which would spoil the flavour of the finest tea: it appears indeed to possess little if any extractive principle, until it shall have been subjected to some of the mysterious agents that it meets with on coming into contact with the soil, and which convert it from rain into spring water. This hypothesis is borne out by the following act, that rain-water, fresh fallen from the clouds, is insipid and flat; but, if passed through a filtering-stone, it acquires that desired briskness which renders it the most pure and refreshing beverage within the range of nature and art, though even then not so good for tea. Our readers are of course aware, that a filter is useful only for water that is feculent; a muddy, weedy, dirty liquid, if percolated through a filter of even so economical, simple, and homely a construction, as one that we shall shortly describe, will be converted into a clear and delicious fluid. On carbonate of lime, sulphate of lime, &c., a filter will have no effect; the latter remark is addressed to our unscientific readers, who might else conclude that, by filtration, water would be purified from stony matters held in solution, as well as from other and more palpable interpolations.

Notwithstanding our boasted national superiority, and our rapid advancement in the arts, we continue to build cottages without sewers, tanks, or wells; we erect villas, and if we put pipes round the roof to carry off the rain, it is all we do; and where do they carry it? into a main-pipe, at the lower end of which we leave the tenant to place a tub; this vessel overflows with the first heavy shower, and the back premises become, and continue for some time to be, a mass of mud; a run of dry weather ensues, the water becomes putrid, or is used so lavishly, that the tub is quickly emptied, the staves open, and by the time the next rain falls the tub will hold no water. We have known handsome, and as the auctioneers style them, "*gentlemanly* residences," no better supplied with one of the chief blessings of life, pure rain-water, than we have described; and whose inhabitants at the same time depend for the remainder of their "soft water" upon a dirty duck pond, the fluid in which is equally liable to disappear with the droughts of summer; the "hard water" of the establishment being indeed so rigid, that it is like liquid nails. This appears to us to be the very perfection of improvidence and bad management. We have an opinion, but are by no means prepared to assert it as a fact, that tanks might be universally adopted, even to the exclusion of wells; unquestionably the expense of building an immense tank would be less than that of sinking a well: but we repeat, we merely throw out the hint, any of our readers who may be inclined to calculate the comparative costs could determine the results, by the rough sketch we shall lay before them of the expense of the former; respecting the latter we can offer no data.

From the east came all our knowledge; from the scorned Hindoo we derive the very name of *tank*. For ages anterior to the subjugation of our little isle,—that boastful "*parvenu*" among the nations,—when Rome herself was emerging from the shaggy skin of barbarism, India had long been the seat of learning, of arts and sciences; and in civilization was foremost in the world.

When we were dwelling in our aboriginal forests and caves, dependent upon trickling rills and standing pools for our precarious supply of that necessary fluid, the mighty intellect of the East had erected spacious receptacles for surplus water;—had taken advantage of abundant supplies, to garner it up for future scarcity. The tank in Calcutta, from which the principal square takes its name, is sixty feet deep. It may be objected, that it is idle to compare the burning climate of India with one so notoriously humid as that of England, or to argue that usages which obtain, and contrivances that are available, nay, requisite, in that country, should be advocated as essential in our own. To this we would reply, that, if any country can be pointed out where summer droughts are unknown, we would say, *there* no tanks are wanted; and if England be one of them, that we are erroneous in our advice. Nor is it, indeed, alone the aridity of the hot months which we have to guard against; we are also subjected to the privations incidental to a long and severe frost, that of the late winter, for example, when, even in London—(where, if physical force, superior energy, scientific knowledge, and beneficial combinations, can be exerted to effect a desired end, it would be there accomplished)—even in London, much individual suffering and privation were felt, from the impossibility of obtaining a supply of water, in consequence of the freezing of those pipes which communicate with the "*mains*" beneath the pavements. This leads us to notice a very sensible and simple remedy for future contingencies, which we met with in a newspaper, and will here transcribe.

"During the late frost, almost every family in England has suffered from an evil, which might have been very nearly, if not entirely prevented, by a very simple precaution, and at very inconsiderable expense. On the return of mild weather, the pipes, in most cases, have burst, and great injury has been done to property and health. If the water-pipes had been inclosed in pipes or cases, and surrounded two inches, or even one inch, by saw-dust, coal-ashes, or, better still, powdered charcoal (which is one of the best non-conductors we know), the water in the pipes would have retained its temperature, and the inconvenience complained of could not have taken place. There would also be this additional advantage, that, in summer, the water would not be (as most of the London water is) tepid when drawn from the pipe.

"We have been greatly surprised to find that, in houses built with the utmost care, at very great expense, and by the most eminent architects, such an obvious and simple preventive against so general and serious an evil, should have been so generally overlooked."

It does, indeed, afford matter for surprise, that improvements should progress so slowly, as that, in the present year, anno Domini 1838, we should require to be instructed in so obvious and necessary an appendage to our buildings. The circumstance of tanks being in such very unfrequent use, is also wonderful. It is not that the outlay is alarming. We see, all over the southern part of the island, farms of perfect beauty,—substantial, extensive, well-appointed,—the very picture of opulence, and of the energy and pride of the owners,—acres of which are covered with barns, granaries, stabling, cart-houses, cattle-sheds, *shealings*, pigsties, &c., and yet not one foot of pipe or gutter, except perhaps round a portion of the roof of the dwelling-house, has been adopted. No provision is made for the comfort of their numerous herds of cattle in heat or frost, but they are left to depend upon the pools, ponds, ditches, and, worse than all, the filthy, nauseous drainage of the farm-yard,—that unnatural beverage,—stagnant, dark with rank oozings, fetid, fermenting in the sun, and poisoning the air, by exhaling those noxious particles, in the owner's ignorance of danger, or his wanton wastefulness, which ought all to be conveyed into under-ground receptacles, to form the (perhaps) most invaluable and useful portion of a farmer's surface outlay,—liquid manure.

We have hinted at the *danger* of allowing stagnant waters to evaporate upon the surface of the ground, and will elucidate our meaning. England, until within the last half century, was, in her low districts, an ill-drained country. Pestilential vapours steamed from the oozy soil, tainting the atmosphere, and inducing that peculiar species of fever known by the name of ague. The very fens of Lincolnshire are now, in consequence of good drainage, inhabited by a race who know no more of that terrible local disorder, which was once their opprobrium and their curse, than do the dwellers of her merry uplands. The surface of India is *comparatively* covered with *open* tanks on a gigantic scale; miles of stagnant water are there built in by masonry, and provided with sluice-gates, in order at pleasure to irrigate the rice crops. From these unthought of sources of pestilence emanate those devastating fevers (foremost of which is the fateful cholera), which depopulate whole districts, and spread their contagion to the healthful spots, " blasting their wholesome *neighbours*." That mighty evil, the Asiatic cholera, tracked its fell course along the margins of the rivers (save where it was conveyed over lands and seas by means of contagion among travellers), again sought its congenial dankness of ill-drained soils, and reached our own affrighted country, where the proof of the assertions we have advanced could have been as *generally* made manifest, as they were *individually* to ourselves, by tracing its comparative mildness in the upper portions of the land, and contrasting it with the virulence of its attacks, and the formidable number of its victims, in low, damp, crowded situations. All fever is poison; frequently a miasma, imbibed by our lungs, or pores, or both, from whatever cause, though chiefly from the malaria of standing pools, sluggish streams, the evaporation from back waters, docks, canals, and, to come nearer to our own subject-matter, the evaporation from farm-ponds, ditches, and drainage, many an unwelcome fever, particularly of the putrid, as well as of the low intermittent kind, has broken out in a rural and apparently healthful spot, which has owed its unsuspected origin to the proximity of a stagnant pond. Water which is suffered to remain on the surface, is our master and our tyrant; water which we convey beneath the surface, is our servant and our friend. Of course, it will be needless for us to say that we wage no war against rivers and tumbling brooks. Motion is life, and where there is a current, little apprehension need be entertained. Still we would observe, that as it is mercifully ordered that many of those noxious vapours which are inimical to human life, are heavier than the wholesome portion of atmospheric air (as in the well-known instance of the Grotto del Cane), and therefore should hang sluggishly but a few feet above the level of the ground, we would suggest, that, if possible, all dwellings should be raised considerably higher than this dangerous surface; and further, would advise that, if a dwelling is to be erected, a site should be chosen on the slope of a gentle eminence, rather than on a plain.

In advocating the expediency of adopting the use of tanks generally, we by no means pretend to the merit of a discovery. We are aware that, in some parts of Kent, and in a local district of Berkshire, they are known and appreciated. Our aim is, not so much to extend the knowledge of their existence (for all our readers must be vaguely aware of such an appendage to a homestead), as to state their advantages, to impress a necessity for their use, and to facilitate their adaptation, by a detailed account of the method and cost of their building. In very extensive farms, we would advise that two, or even more tanks be made; one for the domestic comforts of the dwelling, near the wall of the back kitchen, for the convenience of affixing a pump inside the house; another near the first range of buildings; and a third at the further end of the premises. In small establishments, one will be found amply sufficient. We ourselves, having known the *inexhaustible* comfort of a tank in a former residence, which contained fourteen hundred gallons of water, are, at this very period, in the course of having one erected in our present abode, and are, therefore, prepared to give the necessary details, as well as to suggest improvements for our own advantage, and offer a knowledge of them to our readers.

A tank should be built of a circular shape, gathering to the top in the form of a dome, and at the bottom sloping like a basin, thus every where avoiding angles. At the apex an opening is to be left for the facility of dipping, as well as to admit a man to descend and clean or repair it, in the (rare) event of such contingencies being required. It ought to be built of the very best and soundest bricks, and with the best mortar, which is that obtained from thoroughly burnt limestone. The internal surface is to be coated carefully with Parker's cement, incorporated with one-third of sharp washed sea-sand, to the thickness of *at least* one-third of an inch. Near to the surface of the ground a brick is to be left out, in order to let off any surplus water that might overflow from the tank in the event of a deluge, or a long continuance of heavy rain; or, should a well or other receptacle for water be contiguous, we would recommend that a pipe be there inserted, and conducted thither under ground. Economy being, doubtless, an object with most persons, we are enabled to state a plan by which half the quantity of bricks will be saved which were hitherto considered necessary, and at the same time the work will be rendered more strong and compact. This consists in cutting the bricks in two, so that it will be four-inch work instead of, as heretofore, nine-inch. By thus dividing the bricks, they will lie closer, and gather into the circular form more truly. The mould that is excavated will serve as an admirable top-dressing for meadow land, unless it be found of an inert nature below the top. In that case it should be placed in a heap in some waste corner of the premises for a year or two, when it will be found to have become so mellowed by exposure to the atmosphere in the course of a year, as to form a valuable addition to the surface-soil.

Under the collecting pipe through which the rain-water is to find its way into the tank, a tub is to be placed having a false bottom, fixed about three quarters down from the top, and pierced full of holes. Upon this a layer of coarse, well-washed gravel is to be placed, with about a peck of large charcoal. At the top a strainer made of dairy-cloth (cheese-cloth or canvass), fastened into a hoop, movable at pleasure, and bulging deep in the middle; for if it were to be strained nearly tight, and a flush of rain were to fall, the water would fly over in all directions. The canvass, stones, and charcoal, are evidently intended to catch the impurities from the roof of the house, such as mosses, lichens, leaves, soot-dust, &c. All these decomposable matters, if suffered to enter, would be subjected to the process of decomposition, and fermentation would be induced, though in a minor degree, when uninfluenced by the direct ray of the sun; and the water would become speedily unpleasant for all domestic purposes.

The filter should also be a tub or barrel, placed on a stand in the dwelling-house. A false bottom, similarly pierced and placed, must be fixed within it, and upon it a layer of gravel, just large enough not to pass through the holes; upon this a peck of bruised charcoal, and over that a stratum of thoroughly cleaned sea or river sand, not less than a foot in depth; and on that again, another layer of clean gravel stones. The tub should be filled daily for family use; and, however delicious the well or pump water may have been found, we venture to predict, that (excepting for tea) the preference will be given to filtered rain water.

We cannot too strongly impress our readers with this important fact, that, upon the nature of the water used in a family, mainly depends the health of its members. Well-water, however limpid it may appear, and delicious it may taste, will, if chemically analyzed, almost invariably betray the presence of some detrimental mineral held in solution, until it shall be released in that wonderful laboratory—the human stomach. Several of the most painful disorders—the stone, gravel, &c.—are supposed to owe their existence to the inimical properties of "hard water;" and yet more dangerous is this *best of water*, which, on falling from the heavens, is suffered to stagnate near the dwelling, and to which many an unfortunate family is obliged to have recourse for their entire dependence, in consequence of the ignorance, idleness, or avarice of its master. We will not admit even poverty as an excuse (though abject penury *must* escape censure), for the poorest householder knows, and perhaps *best* knows, the value of health—for himself, who must provide for the wants of his family; to his wife, who is the presiding genius of the comforts of home; to his children, whose expenses are so cruelly augmented to him in the formidable incurrence of a "doctor's bill," with its indefinite amount!

A stagnant pool is the habitat of innumerable insects, animalculæ, and reptiles, as well as of various noxious plants. A person of the most obtuse feelings, and feeble powers of vision, must be shocked if he will but contemplate, in a wine-glass, the water from such a contiguous pond, whence his children are obliged to slake their thirst. No microscopic medium is needed in order to observe the gambols of those innumerable creatures that fill the fluid almost to solidity! Horrible thought, that the human frame should become the recipient of such disgusting tribes of living things, there to engender, and contaminate our very life-blood! For, alas! we are deprived of the consolation of believing, that the great degree of heat of the human stomach, and our own wondrous vital principle, will destroy reptile vitality. Too many proofs exist to the contrary. "Instinct with life," indeed, is in every portion of the stupendous world! Farmers who omit to provide wholesome beverage, as well as proper food for their families and their cattle, are far more reprehensible than those "penny-wise pound-foolish" people, who, to avoid the outlay for a sullage pit, allow the best portion of their manure to soak and ooze away, tainting the sweet air around, instead of converting an absolutely wasteful nuisance into a remunerating profit, and a blessing. These men we have long considered in that degraded class of stolid beings, "all too unfit to hear themselves convinced!"

To return to our tank: In calculating the contents, the number of cubic feet must be ascertained; and, to do this with facility, we will assume a square tank as an example, the breadth of which, in the clear, is six feet, and the depth seven feet. Multiply 6 by 6, and that product by 7, which will yield 252 cubic feet. As, therefore, a cubic foot will contain rather more than 6⅛th gallons, a square tank of 252 feet will hold about 1545 gallons. A cylindrical tank of the same dimensions, owing to the cutting-off of the corners, will not contain so much by about one-fourth. Five or six hundred bricks will be sufficient, not including the bottom, which some prefer to be formed of two strata of flat house tiles, the lower tier laid in mortar, the upper imbedded in Parker's cement, and sea-sand. The workmanship in laying the bricks, as well as applying the coating of cement, must be of the very *best* description, otherwise the tank will not retain water. The cement is of various prices, but the *best* must be used. From one to two bushels will suffice. The hole at the top must be finished with a frame-work of wood, on which a trap-door with hinges is to be affixed. For the convenience of dipping when the pump is not used, a wooden "*piggin*," or deep bowl, should be fixed to the end of a pole, *not* long enough to touch the bottom of the tank, for fear of injury to the cement. A gauge to ascertain the depth of water is necessary. This is simply contrived, by fastening a piece of lead securely on to the end of a stout string, which string must be the exact length of the height of the tank; a permanent knot being tied in it at the highest level to which the water could rise before it flows over into the exit, near the surface of the earth, which we have before described.

Water thus *harvested*, retains an equal temperature; therefore in "summer's heat and winter's flow," and is always available. Can any farmer, to whom the outlay of from ten to twenty or thirty pounds (according to the number and size of the tanks) is not a very serious consideration—*can* a person hesitate between the misery and the comfort of his live-stock?

A DOMESTIC RABBIT-WARREN.

It will perhaps be superfluous to detail the most accredited methods of keeping rabbits in hutches, for the perusal of those persons, to whom the plan of a domestic warren may prove intelligible, because the hutch system is well understood, and is generally practised; we shall therefore merely offer a few hints and directions, impress two or three facts—the result of experience—and then proceed to the subject which forms the title to this paper. Air, dryness, good feed, cleanliness, with very little succulent food, are essential to rabbits, which are debarred, by this unnatural system, from the healthful enjoyments of exercise in their own native wildness. For our own parts, we confess that we should almost as readily attempt to immure a tricky squirrel in a tread-mill cage, or confine the soaring lark within the wires of a prison, as we should retain in those close boxes the happy denizens of a warren: but as the animals are subservient to man,—as these creatures among others, "are made to be taken and confined," it remains for us merely to advocate their helpless state, and to inculcate mercy.

It must be gratifying to all persons who are proprietors of live-stock, to conduce to their comfort and well-doing, for the mere delight of indulging in benevolent feelings; but, when it is made manifest, that, by obeying the dictates of nature as much as possible, and making their artificial mode of living approximate as nearly to that which was intended for them, as the relative states of freedom and subordination will allow, we shall be gainers in a double sense,—we should evince unwonted stolidity, not to bend our attention to effect so desirable a result. It is very little known, that an artificial or domestic rabbit-warren can be constructed with ease, and at a trifling expense, which will not only allow a free range to the animals where they breed, and to enjoy themselves unmolested by man, but that they may be caught, examined, fed, and attended to, without the delay of five minutes. We have had ample experience of the feasibility and highly advantageous nature of this method of keeping rabbits, and therefore speak positively respecting its vast superiority over that stiving unhealthy system of hutching, at present considered the only alternative with that of total wildness in the warren.

During a residence of nearly three years in that south-eastern portion of our island, the Isle of Thanet in Kent, we had practical proof of all we have asserted, and, therefore, feel no hesitation in prognosticating similar successful results to others who may be inclined to put the scheme in practice. We should premise, that those districts in which the subsoil is of chalk or other material, equally difficult of perforation, will be found most available for a domestic warren; a sandy soil, or one of rich soft loam, would afford too ready facilities for burrowing, and the animals would shortly find an exit and escape; therefore we would advise that only in chalky, stony, dry, impervious subsoils, the trial should be made.

In any part of the premises deemed most convenient, a court or a stable-yard for instance, the soil must be removed full six feet deep, and three wide; a foot from this opening another must be made of the same depth, but *four* feet wide; the latter hole is to be bricked all around as well as the floor; and at the bottom of that part which divides it from the other space, an opening must be made, large enough to admit a full sized rabbit to pass through, thus forming a communication between the two compartments. Down the party-wall an iron plate or door is to be slided at pleasure, in two grooves, by a rope from above. Light covers of wood, or of oil-cloth, or tarred sail-cloth, are to be fitted with hinges, on a frame-work of stout wood, and made to open towards the south, in order to admit all the warmth possible from the sun. Every morning these covers should be propped up with sticks, in which deep notches must be cut, so that the opening may be wide, or narrow, according to the state of the weather, as it is not advisable to allow more moisture to find access to the rabbits than can be avoided. Indeed, we omitted to say, that, while the excavations are being made, a drain ought to be constructed in each, over which a small iron-grating should be fixed, and the floors ought to slope towards these exits; thus dryness, so essential to the health and comfort of the animals, will be insured.

The larger of these two excavations, which we have been describing (the bricked compartment), is the trap,—the smaller we will call the warren. In the trap, *and only in the trap*, the rabbits must be fed. It is self-evident, that the more nearly to a state of nature we approximate the condition of our live-stock, the greater range we may afford them in their diet. Green food must be very sparingly administered to all that are confined in hutches, but those which are allowed a roomy space, with the salutary exercise of burrowing, may with safety be indulged with green food at their own discretion,—attention being paid to select those esculents which they are known to prefer when in a wild state. We incline to think that animals in a state of nature are liable to no disorders, but that we, in consequence of our ignorance of those wise laws by which they are taught instinctively to vary their diet, and thus preserve their health, inflict diseases upon the unoffending creatures, which we then exercise our folly, not our rationality, to remedy: oh, the torture to which ignorant and conceited man subjects his speechless dependents! Rabbits in hutches thrive *in spite of* cabbage-leaves, not *by means of* that rank succulent unnatural food. Fifty generations of these animals have lived and passed away, in their wild extensive warrens, without the possibility having occurred of their encountering a cabbage-leaf. The mild beautiful herbage, that evident staple of their lives, as bread is of our own, varied with the thousand flavours, and healthful adjuncts which they meet with in the surrounding weeds,—as we judiciously assist digestion with different condiments,—this natural food, grass, is never given to rabbits in hutches, although they can obtain little else in the vicinity of their native warrens.

We would then strenuously advise that not any of the rank succulent vegetables of the garden be offered to creatures so artificially placed, that the option of choice is no longer in their power. Twice, or even three times a-day, there should be a supply of bran and oats in troughs, let down into the trap, by means of a stick fastened to each trough, about four feet in length. A few handfuls of fresh grass, with its attendant weeds, ought also to be given daily, and the refuse should be taken away every two or three days; this can be managed with ease and expedition by means of a small ladder. It will be obvious that the trap is made deep and wide, in order to admit of easy access for the facility of cleaning the place and selecting the rabbits, which is effected in the following manner. As soon as the food is let down, the creatures, from habit, will run through the trap-door into the trap, and when it is judged that they are all collected, the person (keeping out of sight, for they are naturally shy and would run back into their warren if they were to see any one, or hear a noise) must let down the trap by means of the long rope, and he can then select at his pleasure.

We think it likely that some of our readers may be inclined to question the utility of the opening to the warren, and may suppose that the trap would be sufficient; we assure them it is essential, for not only must a space be cleared for them to begin their operation of burrowing at that depth below the surface, but occasionally it may be requisite to clear away any loose soil which they may have excavated, as well as to secure the manure, which is valuable; besides, the two openings afford a free circulation of air, and more light than could be admitted by the trap only.

In many districts of this country not a warren or a wild rabbit is to be seen for twenty, nay, fifty square miles, yet, at all the poulterers in large towns within those districts, *wild* rabbits *so called* are always to be obtained. There exists an imaginary preference in favour of wild rabbits, and therefore the public is never let into this secret, that they never *purchase a wild one*, excepting within an available distance from a warren. *All others* are bred in hutches, and all warranted *wild!* This we know to be fact. Independently of the superior health enjoyed by creatures nearly in a state of nature, other contingencies are prevented by the domestic warren system. Rabbits are exceedingly shy, and those unnatural propensities, the destruction of their young by the fathers, and devouring them by the mothers, which many writers have endeavoured to account for, *quite unsatisfactorily*, are avoided; they are, too, probably caused by the officiousness and ignorance of man; in the first place, by interfering with the mother, in the next by having debarred her from that species of diet which her own instinct would have led her to select, to suit her maternal duties.

As our present notice refers only to the subject of a domestic warren, we abstain from offering any remarks or advice on the numbers to be kept, the sorts and advantages of this prolific and valuable live-stock, because there are few small farmers who are not aware of all we could say, by experience, in the troublesome, and every way ineligible system, of hutches, when compared with that of the domestic warren. We repeat, that we have had ample experience of its perfect success, and had it no other merit than being a merciful and rational plan, it ought to supersede all others.

ON HAY-MAKING.

By Mr Towers, C. M. H. S.

Referring to No. 39, for December 1837, of this Journal, in the paper '*On some Imperfections in Scotch Farming*,' I find the following observations:—

"I shall only add a few words as to hay-making, in which we are wofully behind. On the south confines of Perthshire, seeing a field that had been cut some time, and was quite ruined with wet, I asked how it had happened, and was told by a neighbour that he, whose ground was 200 feet higher, had had his in stack several weeks. The fear of damp causing it to heat, leads to an exposure of such incredible duration, that perhaps no season of drought in Scotland has ever yet been long enough for it to escape the destructive alternations of wetting and drying till the hay is worn out. The system of waiting in a dry season till it gets a little rain, to produce a final growth, generally ends by landing it in a long series of bad weather; and the plan of changing the small heaps into large ricks in the field, by which it is held to be safe, has the effect of unnecessarily increasing the labour, adding to the delay, and withering a new and large surface."

These remarks produced unqualified surprise; I knew the Scots to be a patient, cautious, and persevering people, and had formed the opinion that they had taken the lead in farming, leaving us Southerns far in the rear. Now, however, admitting the quotation to contain a recital of facts, there can exist no manner of doubt whatever that, in so far as respects the important process of harvesting the hay, the farmers of England deserve the palm. I regret my inability, from the absence of local knowledge, to do the subject all the justice it requires; yet, were no other evidence in existence, I should esteem the mere perusal of the extract above given to be conclusive, and as tending to prove, beyond doubt, that the system is bad, and pernicious, utterly unworthy of a people so enlightened, and out of all keeping with the 'onward' spirit of the times.

It occurred to me that I ought, without delay, to present the agricultural reader with a complete description of that admirable method of hay-making, which is the pride of our metropolitan county—this I am enabled to do, not only by reference to works of authority, but by practical experience. Subsequently, the perusal of an article in the Irish Farmers' Magazine, enables me to add some facts in a practice recommended to the hay-makers of the sister kingdom. On the whole, then, I hope to shew that delay is not only dangerous, and highly reprehensible, but altogether unnecessary. Seasons may, and do vary; even with the wisest plans and the most energetic efforts, great perplexity will occasionally exist, but still, take one summer with another, *hay* of the finest quality may be, and is, made and got together in a very few days; and he ought to be regarded as an indolent or bungling farmer, who could not cut, make, and finally secure a hundred acres of the heaviest crop of grass, between Monday morning and Saturday night.

In what respects the operation of mowing, there are many counties in which the mowers perhaps surpass those of Middlesex; the scythe being handled with a dexterity and precision which leave the surface level and almost free from mark; but, in the subsequent processes, Middlesex furnishes a pattern of skill and industry, it is to be hoped will be imitated by those northern agriculturists who have afforded so splendid an example of what can be effected by intelligence and assiduity. As hay-making, upon an extensive scale, is of the first consequence, I shall, without further preface, introduce the reader to the excellent directions which are to be found in *Baxter's Library of Agricultural Knowledge*; the processes in the gross will thus be made apparent, though they will admit of local modifications, as respects climate and weather. The leading principle of the English farmers,—those of Middlesex and the adjoining counties in particular,—must never be forgotten, "Make hay while the sun shines,"—and never remit or intermit exertion, till the work be accomplished; for, "while anything remains *to be* done, nothing *is* done."

"In order that the subject may be clearly understood, it will be necessary to relate the particular operations of each day, during the whole process, from the moment in which the mower first applies his scythe, to that in which the hay is secured either in the barn or in the stack.

" *First Day.*—All the grass mown before nine o'clock in the morning is tedded" (*i. e.* tossed about with the forks), " in which great care is taken thoroughly to loosen every lump, and to strew it evenly over all the ground. By this regular method of tedding grass for hay, the hay will be of a more valuable quality, heats more equally in the stack, consequently, is not so liable to damage or fire; will be of greater quantity when cut into trusses, and will sell at a greater price; for, when the grass is suffered to lie a day or two before it is tedded out of the swath, the upper surface is dried by the sun and winds, and the interior part is not dried, but withered, so that the herbs lose much, both as to quality and quantity. The next operation consists in turning it with the same degree of care and attention, and if, from the number of hands, they are able to turn the whole again, they do so, or at least as much of it as they can, till twelve or one o'clock, at which time they dine. The first thing to be done after dinner, is to rake it into what are called single windrows. That is, they all rake it in such a manner as that each person makes a row, which rows are three or four feet apart. The last operation of this day is to put it into grass-cocks."

I once employed an active man, who had been bailiff to a gentleman at Edmonton near London, where he managed a hundred acres of grass-land. I practically acquired this person's method, while I observed his operations, and listened to his remarks. The chief reason assigned by the man for this early and effectual tedding was this,—" If, said he, you leave any knotted, entangled masses, the grass becomes soft (flaccid); it can be separated easily while green and firm, but if it once become weak, the herbs cannot be separated:—do the work completely at first, and all will be easy afterwards "! He was right: the weather was fine, and the air drying: the hay was nearly made in two days! Should frequent rains take place while grass is green, the object of the maker is directly the reverse of what it would be in a steadily dry season. He tries to retard the making, merely turning the swaths over a new surface of ground, after intervening gleams shall have dried that, and the upper side of the grass swaths.

" *Second Day.*—The business of this day commences with tedding all the grass that was mown the first day *after* nine o'clock, and all that was mown this day *before* nine o'clock. Next, the grass-cocks are to be well shaken out into staddles (or separate plats), of five or six yards in diameter. If the crop should be so thin and light, as to leave the spaces between these staddles rather large, such spaces must be immediately raked clean, and the rakings mixed with the other hay, in order to its all drying of an uniform colour.

The next business is to turn the staddles, and after that, to turn the grass that was tedded in the first part of the morning, once or twice, in the manner described for the first day. This should all be done before twelve or one o'clock, so that the whole may lie to dry while the work-people are at dinner. After dinner, the first thing to be done is to rake the staddles into *double* windrows—in doing which, every two persons rake the hay in opposite directions, or towards each other, and by that means form a row between them of double the size of a single windrow. Each of these double windrows is about six or eight feet distant from each other. The next operation is to rake the grass into *single* windrows; then, the double windrows are put into bastard-cocks, and lastly, the single windrows are put into grass cocks; this completes the work of the day.

" *Third Day.*—The grass mown, and not spread on the second day, and also, that mown in the early part of this day, is first to be tedded, and then the grass-cocks are to be spread into staddles as before, and the bastard-cocks into staddles of less extent. These lesser staddles, though last spread, are first turned, then those which were in grass-cocks, and next, the grass is turned once or twice before twelve or one o'clock, when the people go to dinner as usual. If the weather has proved sunny and fine, the hay which was last night in bastard-cocks, will this afternoon be in a proper state to be carried. It seldom happens in dry weather, but that it may be carried in the third day, but if the weather should, on the contrary, have been cool and cloudy, no part of it, probably, will be fit to carry.

" In that case, the first thing set about after dinner, is to rake that which was in grass-cocks last night, into double windrows. After this, the hay which was last night in bastard-cocks is made up into full-sized cocks, and care taken to rake the hay up clean, and also to put the rakings upon the top of each cock. Next, the double windrows are put into bastard-cocks and the single windrows into grass-cocks, as on the preceding days.

" *Fourth Day.*—On this day the great cocks just mentioned are usually carried before dinner. The other operations of the day are such, and in the order as before described, and are continued daily until the hay harvest is completed.

" In the course of hay-making, the grass should, as much as possible, be protected, both day and night, against rain and dew, by cocking. Care should also be taken to proportion the number of hay-makers to that of the mowers, so that there may not be more grass in hand at any time than can be managed according to the described process. This proportion is about twenty hay-makers (of which number twelve may be women), to four mowers. The latter are sometimes taken half a day to assist the former; but in hot, windy, or very drying weather, a greater proportion of hay-makers will be required than when the weather is cloudy and cool. It is particularly necessary to guard against spreading more than the number of hands can get into cock the same day, or before rain. In showery and uncertain weather, the grass may sometimes be suffered to lie three, four, and even five days in swath. But before it has lain long enough for the under side of the swath to become yellow (which, if suffered to lie too long, would be the case), particular care should be taken to turn the swaths with the heads of the rakes. In this state it will cure so much in about two days, as only to require being tedded a few hours, when the weather is fine, previous to its being put together and carried. In this manner hay may be made and stacked at a small expense, and of a good colour; but the tops and bottoms of the grass are insufficiently separated by it. If, from unforeseen circumstances, the hay has been damaged by sudden or successive rains, it will be advisable to *salt* the *hay* as it is stacked."

We shall speedily have occasion to describe the processes of stacking and covering; but previously, it will be essential to notice one circumstance which is, that some persons have rarely failed to secure crops during catching seasons, when others have lost their hay, or had it very much damaged. Seasons and climates produce great local differences, yet the criterion now to be mentioned, should, in every possible case, be most strictly attended to.

It is customary to wait until the grasses have grown to their utmost extent, in order to secure as *heavy* a crop of hay as possible; and there are seasons wherein the weather takes so decidedly dry a character, that little fear or doubt need be entertained. But this is rarely the case, and it frequently becomes wiser policy to secure a moderate crop, than to incur a serious risk by delay. I once knew a man who, by dint of persevering attention to what is styled "the main chance," rose from very low circumstances to great affluence. He was a dyer by profession, but purchased much land in Somersetshire, and farmed a considerable portion of it. This person conversing with me on the great loss sustained by many, when their hay, *three-fourths made*, becomes soaked with long-continued rains, observed, to this effect, "These men aim at too much, they wait for the utmost bulk, till they can wait no longer, as the grass *must* be cut, or it will decay at the bottom. I have been a haymaker nearly forty years, and have hardly, in one instance, failed to carry in good condition. *In the month of June, earlier or later, there are three or more days, wherein the wind blows from the north-east, and that period is always dry.* When that wind first occurs, I seize the moment, call in the hands from the factory, cut the grass, and carry the crop before the wind veers to the south." The remark and the theory hold good as respects the south-western counties, where the wind from any quarter between north and east, is the sure concomitant of dry weather; and as the object was to secure quality rather than bulk, it was almost invariably attained, and with it much profit, because the great loss of hay, in a dripping season, insured a proportionate advance in price; and hay of really fine quality became in great request.

On one occasion only, during a residence of seven years in the neighbourhood, did I witness a failure in the old gentleman's prognostic. I believe it was in the wet summer of 1828, the wind did not fix in the quarter which formed his criterion, but blew constantly from the rainy quarter, and he lost his crop among others.

I mention this circumstance, not by any means to induce every one to consider *June* as the hay month, but to inspire caution and watchfulness. There, perhaps, is to be traced everywhere a *season*, a period of a few days at least, when certain indications give assurance of settled weather. Now, if these be improved, they, " like the tide in the affairs of men, which, taken at the flood, leads on to fortune," will almost infallibly suffice to secure the hay! There must, however, be no half measures, no daudling at the work; all must be bustle, energy, and decision; and be it never forgotten, that *a ton of good hay is worth three tons of half-decayed rubbish* void of odour or flavour, and worthless in the stable or cow-stall.

Stacking or Ricking.—" There are no hay-stacks more neatly formed, or better secured, than those of Middlesex. At every vacant time, while the stack is carrying up, the men are employed in pulling it with their hands into proper shape; and about a week after it is finished, the whole of it is properly thatched, and then secured from receiving any damage from the wind, by means of straw-ropes extending along the eaves up to the ends and near the ridge. The ends of the thatch are then cut evenly below the eaves of the stack, just of sufficient length for the rain-water to drip quite clear of the hay. When the stack happens to be placed in a situation which may be suspected of being too damp in the winter, a trench of about six or eight inches deep, is dug round and nearly close to it, which serves to convey all the water from the spot, and renders it perfectly dry and secure."

The foregoing remarks are correct, but not quite explicit, upon the mode of carrying and making up the ricks.

In Berkshire, and elsewhere, I have remarked the excellent practice of spreading out the hay in the mornings, after the dew has been taken up, into breadths or staddles; the waggons, according to the quantity of hay, are brought into the field, and the final drying by the sun being effected, the rakers draw the breadths into ridges, which are thrown by forks into the waggons; the women rake the ground in the mean time, and thus every particle is cleared off. In building large stacks, which cannot be completed in a day, the prudent farmer is always provided with a tackle and tarred rick-cloth, which latter is hoisted as a roof-covering to the hay, thus securing it from any damage whatsoever, till it can be regularly thatched. In Somersetshire and other western counties, it is customary, after putting in order, to remove all the loose hay, and produce a regular settling of the entire mass, to cut the bottom of the stack, two feet above the base, with a hay-knife, by which means the lower part slopes at an acute angle to the base, which either rests upon hurdles supported by stone staddles, or upon some open material which raises it altogether from the ground. The Dutch or open barn was much used some years since, and afforded security at once, without trouble of thatching.

Hay, well made, and carried without rain, in that state of proper dryness and elasticity of texture, not amounting to crackling aridity, is of a bright greenish-yellow colour, and this it retains for many months in the rick, wherein it will always heat and acquire a sweet or saccharine principle, but never char or take fire. If the colour change, and the fine odour be lost in the field by too long exposure to rain, the stack should be salted as it is building, by sifting the salt through a wicker sieve over every superficial layer of a foot or less in thickness. Perhaps forty pounds to the ton will be amply sufficient, though hereupon persons may differ much in opinion; at all events, the salting appears to correct or modify the heating property, while it confers a flavour which live-stock and sheep greatly affect. Salt will, however, destroy the fine colour of the most perfect hay, and is dispensed with, unless more or less damage have been incurred by exposure to rain.

That no document may be wanting whence to derive a fair comparison of several modes practised, I beg to adduce the following details extracted from No, 43 of the Irish Farmers'

Magazine, p. 201, article *Hay-making*, by Mr T. Flanagan, steward to Mr Guinness of Beaumont.

Cutting.—"The grass is not cut until it has come to its full growth, and yet before it has ripened its seed, as by cutting it in a growing state the immature juices of the plant may bring on a violent fermentation, and thus deprive the crop of much of its substance, or perhaps destroy it altogether, when the farmer has calculated on its being in a state of safety."

It is here evidently the object to obtain *bulk*, but in a moist and vaporous climate like that of Ireland, security is thus frequently compromised. This will be evident on perusing a paragraph which will speedily be quoted. In the mean time, the arguments employed can scarcely be deemed admissible, for although no one (*cæteris paribus*), would question the superiority of full-grown grass, yet, as before said, quality in the stack is of paramount importance.

First process of Making.—The grass is never shaken out of the swath on the day it is cut, but on the second day all that was cut on the first is shaken and has two turnings. "By shaking it out the day upon which it is cut, you cause the hay to reduce much by the heat of the sun: but by leaving it in the swath, in popular language, it *soaks* its own sap, and will reduce very little on the next day." Here we find a direct opposition to the process of Middlesex. The argument is not feeble, because it is quite certain that, setting apart a little loss of aroma, the juices must become inspissated, the plant parting with little else than the water of the sap. But will it ever be so completely "*made*, if it be permitted to become knotted and flaccid before it be tedded or shaken out with the fork." However Mr Flanagan never lays his hay on the ground the night after it is shaken out, but gathers it all into grass-cocks that evening, "as, by so doing, the dew goes off the ground much earlier the next morning, than if the hay had been left spread over its surface, and thus one shaking out of the grass-cocks, on comparatively dry ground, will be of more service than three turnings, were it left spread the night before."

The hay is turned twice on this day, then gathered into *windrows* towards evening, and finally made into cocks, each of about one hundredweight. In these it remains all the third day in order "to soak the sap," as by exposure to much sun it is supposed to be "very much reduced." The next work is to gather these cocks in plats, about eight cocks in each, and if the day is likely to be suitable, they are all shaken out, being careful not to cover too much of the ground, which might expose the hay greatly to the sun, and thereby cause it to be discoloured. The hay thus spread is turned twice in the day, and in the evening the whole of the hay of one plat is set up into one large cock for security.

These cocks remain without farther disturbance, and in the following day are "pulled" all round, observing to make them as small as possible at the bottom, in order to admit a free circulation of air under and about them.

This system is pursued until the meadows are all made up; by it "there are but three days making on the hay, until it is put into finished cocks. The hay thus made up may heat moderately, but so far from being an injury it will rather serve it."

Tarpaulins are strenuously recommended. "The loss which one day might occasion in deteriorating the quality of the hay would, in all probability, be three times greater than the first cost of the tarpaulins. Besides, their use enables the farmer to draw in any part of his hay which is fit, and keep the rick unfinished until the whole crop is thus brought in without danger, hurry, or inconvenience."

The conclusion, though somewhat impotent to an English grass-farmer, goes with a sort of very pardonable flourish, when taken in connection with what the writer calls "the slovenly and unskilful practice too generally pursued in Ireland," by which there are in "every season, losses sustained to an amount little known, by gentlemen and farmers permitting their hay to lie so long spread out when making, and subsequently, by being put into large cocks, and allowed to remain in the meadow till late in the season: * * at least one-tenth of the cock is lost by being weather-beaten on the outside, and from the bottom being damaged from the damp of the ground; to say nothing of the loss in the next year's crop, from the injury sustained by the *land on which the cocks* stood, which will *require to be renewed* when the cocks are drawn off!"

Mr Flanagan conceives that he effected much in having hay drawn in, which was only *five days* cut, "and which, notwithstanding, turned out of the finest quality." "Last season, he had *forty-three* acres of meadow made up and finished in the rick in exactly *three weeks* from the commencement of the cutting; the quality was very superior!" *Forty-three acres in three weeks!* An improvement this no doubt, if compared with the miserable practice of hay-spoiling, which Mr F. laments and exposes; but what will the English hay-farmer say to it?

One fact is certain, that, whatever be the effect derived from inspissation of the sap, in adding to the flavour of the hay, it will bear no comparison with that expeditious housing or stacking, which places a well-made crop in perfect security, be its amount what it may, in two or three days! The great art consists in bringing an adequately powerful force to bear at any one or more points where it may be wanted, at any given time. Wisdom and experience direct the adaptation of means to the end, and prompt decision renders this effectual.

In thus attempting to render the practice of English haymaking familiar to the farmers of the north, I have preferred to quote from accredited authority, and to add a few remarks which are the result of my own experience, rather than to give my article a more original character. I can testify the practical excellence of the directions given in Mr Baxter's work, and have felt great pleasure in presenting the extracts from the *Irish Farmers' Magazine*, because they evince much sound judgment, and a real and patriotic spirit of improvement. Climate and localities, the absence of means, and a variety of causes, may present difficulties which cannot be anticipated; but still there are *general principles* which should be acted upon, and these are obvious, they are included in three words,—*energy*, *manual force*, and *dispatch*. The Scots are a serious and reflecting people, they also know what it is to persevere; but *habits*, even if bad or delusive, when once formed, adhere like burrs; it is, however, the office of wisdom to make habit yield to principle, and I address the wise!*

---

* However inconsistent the assertion may seem, we may safely assert that the Scottish farmer *knows* the proper method of making hay, although he does not *practise* it; and the reason for this anomalous conduct,—that he cannot command a sufficient number of hands to perform both it and the turnip husbandry, at the same time, as each should be,—weighs so strongly with him, that, we verily believe, so long as turnips are so extensively appreciated and well cultivated, as they evidently are in Scotland, so long will *hay-making* be neglected, and, of course, the *hay* sacrificed. It is not improbable, that the practice of preparing the food for horses, which we are glad to observe gradually extending itself over the country, will, at no distant period, altogether supersede the necessity of giving *hay* to *farm*-horses. Hay robs the soil of the nourishment which it would derive from the grass when converted into manure by pasturage, and perverts the grass member of the rotation from ameliorating to a scourging crop.—EDITOR.

ON THE DISEASES INCIDENT TO THE MOST USUALLY CULTIVATED PLANTS.—NO. IV.

By GEORGE W. JOHNSON, Esq. Corresponding Member of the Maryland Horticultural Society, &c.

Smut.—In Vegetable, as in Animal Pathology, accuracy in the knowledge of the causes of disease is of paramount importance. To understand the nature, to comprehend the characteristic symptoms, of each morbid affection, is necessarily of high value, because this is the index to the appropriate remedies:—but to know their cause is of still higher consequence, because this teaches us how to prevent infection,—and it is obviously far better to avoid a distemper than to be under the necessity of providing a remedy.

Important as is this knowledge, yet no desideratum in vegetable pathology has been less sought for. Some, but very few, chemists have subjected the diseased parts to the scrutiny of their tests; and a number as restricted of physiologists have endeavoured to discriminate the nature of vegetable distempers. All their researches have been productive of important information, as all carefully conducted experiments must, because the record of a failure even is a beacon to future experimenters.

Many practical agriculturists have had these diseases forced upon their attention by the injury they have brought upon them, but in how few instances have they directed their observations to the cause. In the disease now under consideration, farmers have merely sought for some by which their chance-led ignorance imagined would wash away the infection. Yet the result of these experiments has been useful, for facts are sterling, and are the materials aiding and sustaining the views and discoveries of more scienced and more comprehensive minds.

Wet seasons, animalculæ, organic weakness, deficiency of the parts of generation, and other circumstances have been assigned as the primary causes of this disease, but all the results of experience are against the opinion that these are more than contingencies which aggravate the symptoms, and accelerate the progress, of the infection.

That the smut does not arise from a deficient fecundity is apparent, because it affects and destroys the grain long before the sexual organs are fully developed. Fogs, exposure to intense sunshine when moist, or other atmospheric influences upon the ear after it has been protruded, have been assigned as causes; but these cannot be productive of the mischief, for the disease has been observed during an early stage of the plant's vegetation, and long before it has escaped from the leafy envelopes: this also dismisses the opinion entertained by some, that the disease occurs after the grains are fully formed. It does not arise from the too abundant moistness of the soil, because I have universally observed that the dryest parts of a field are as liable to bear infected grain as the most wet; and we all know that an infected plant stands surrounded by others entirely undiseased.

Some persons have thought that insects are the origin of the disease, but the most accurate observations have refuted this opinion, and shewn that the diseased grains may be an agreeable nidus for the larva, but that these always appear after the disease is matured.

Upon examining some of the diseased grains, Mr R. Somerville found upon them a minute insect, in form like a woodlouse (Communications to the Board of Agriculture), which I know from observation to be a species of the Acarus, and these he considered the cause of the disease, but this is a conclusion unwarranted by observation, for similar vermin are found upon the roots of the Brassica tribe that are affected with ambury, and indeed this genus of insects are invariably found upon decaying vegetable matter:—it is their habitat.

Other persons have thought that the grains injured by the process of thrashing are most liable to the disease, but this is refuted by the fact, that it appears in some years, and is scarcely to be detected in others. The Reverend Dr Hales bruised numerous different sized grains of wheat with a hammer, but the result convinced him that this opinion is erroneous.

Wolfius thought it arose from a monstrosity of the embryo, but M. Aymen has shewn that the male flowers of some plants suffer from the disease as well as the female, and the former we know have no embryo.

Some farmers have thought that pigeons' dung induces the disease, but general experience is against this idea.

Nor is this disease owing to any defect of the sap, for all the parts except the ear are healthful; and there are some plants, observes M. Aymen, having perennial roots, and which are vigorous, yet their seeds are annually attacked with this disease.

Having thus disposed of the causes which have been erroneously assigned, I will now proceed to detail the more correct knowledge that has been accumulated upon this plague of our corn crops.

This disease is popularly known as the *Smut*, *Dust Brand*, and *Burnt Corn*. In France it is as commonly known by the names of *Charbon* and *Nielle volante*.

Botanists, aided by the microscope, have discovered that the disease is a parasitical fungus, which preys not only upon the sap, but destroys the very organic structure of the grain and chaff upon which it affixes. The majority of naturalists agree in distinguishing this fungus by the title of *Uredo Segetum*, but as it has other synonyms, these, and the authors who have employed them, may be usefully enumerated.

Uredo Segetum, Pursh, n. 27.—*Chaos ustilago*, Linn. Syst. Nat. 1326, n. 4.—*Réticulaire des Blés*, Bulliard's Fungi, i. 90, plate 472, f. 2.—*Reticularia Segetum*, Withering, iv. 388.—*Charbon*, Tessier des Maladies des Grains, 299.

Bulliard describes this fungus as globular, extremely fine, and attached to a fine elastic thread. They are exceedingly numerous, enveloping the seed and its chaff of the plants they affect, and are, as well as their own, still more minute seed, of intensely black colour, having a disagreeable smell, not inaptly compared to stale lobsters.

Mr Kirby tells us that Mr Lathbury examined the dust of this fungus under a powerful magnifier, and found it consisted of numerous minute particles, uniform in shape and size, much smaller and blacker than those of the pepper brand, and less easily separable; they seemed to be contained in little irregular cells. This dust or seed is the food of a small shining black insect, the *Dermestes Ater* of Marsham (Linn. Trans. v. 112).

Chemical analysis has demonstrated that this fungus effects an entire decomposition of the vegetable constituents of the grain it infects, the saline constituents of the grain remaining nearly unaltered. Parmentier, Cornet, Girod Chantrans, Fourcroy, and Vauquelin, have successively examined it, and the result of their researches is, that smutted grains of wheat are composed, 1st, of about one-third their own weight of a green, butyraceous, fetid, and acrid *oil.* 2d, Nearly one-fourth of a vegeto-animal substance, perfectly similar to that which comes from *putrid gluten.* 3d, A *black coal,* one-fifth of their weight, similar to that which is found in all remnants of putrified organic compounds. 4th, Free *phosphoric acid,* amounting scarcely to more than .004 of the smut. 5th, Phosphates of ammonia, magnesia, and lime, in the proportions of a few thousandths "We must remark," say MM. Fourcroy and Vauquelin, "that, in one examination of putrified gluten, we found characters very similar to those of the smut of wheat; and that the products of the one are so like those of the other, as to render it difficult, in certain cases, not to confound them together. It requires a man to be well practised in chemical experiments to discern the slight differences that exist between these two putrefied matters, because the differences are only delicate shades, not easily discernible. The contagion attacks especially the gluten, and precedes, indeed prevents, the formation of the starch; since we know positively that this fecula, no traces of which are found in the smut of wheat, suffers no alteration from that septic process, which so powerfully attacks the glutinous substance." (La Revue Philosophique, Nov. 1805, Nicholson's Journ. xxiii. 146.) The ravages of this disease are chiefly, though not exclusively, confined to the cereal plants, Mr Kirkby says it is common to wheat, oats, barley, and rye, and that he has seen *Festuca fluitans* and some other grasses affected with it. Barley and oats are more frequently attacked by it than wheat, which may proceed from the latter being usually steeped before sowing.

Wildenow, who, in his "Principles of Botany," § 331, describes the smut under the name "Ustilago," and as being a small fungus, says, "This singular variety of gangrene occurs most frequently in the species of Gramina, rarely in other plants, sometimes in Scorzonera, Tragopogon," &c.

The ear of corn which is attacked is in general totally destroyed, but sometimes the same ear contains sound as well as smutty grains, and even one end of the same grain has been found diseased, and the other end sound. However, as all the grains in an ear are usually infected, so when one stalk is *smutty*, it generally happens that all the ears from the same root are so too. In March or April, upon carefully opening the hose or blade (*Folium vaginans*) which covers the ear, and examining the young ear, though it was not above one-sixth part of an inch long, and almost close to the roots, M. Duhamel found this embryo already black and distempered,—a fact confirmed by the researches of Mr Kirby. When the diseased ear comes out of the above-mentioned envelope, it looks lank and meagre. About half an inch of the upper part of its stalk is commonly not quite straight. If cut asunder at not more than a quarter of an inch below the ear, it will be found nearly solid or filled with pith; the circulation above is therefore obstructed.

The next most important point for consideration is, from whence is the infection communicated; and the following experiments will be found to have demonstrated that it is capable of being conveyed to the plants, by the agency of the parent seed. These experiments are satisfactory and decisive, for although they are only in accordance with the most prevalent opinion of farmers upon the point, yet prevalent opinions are not always in accordance with truth, and are never to be implicitly received until sustained by evidence which is independent of prejudice, and more accurate than surmise. In all researches we should remember that there was a time when the sun was universally believed to travel round the earth.

Mr R. Somerville, in a paper published in the "Communications to the Board of Agriculture," states experiments fully substantiating the fact that the disease is communicable to the crop from the parent seed. He mixed some smutted grains with others perfectly healthy, and kept them in a box for two months; after which, previously to sowing, he rubbed them together between his hands. The sample was then divided into two equal parts, one of which was well washed with clear water three or four times, and then sown in a drill in his garden. The other half was sown similarly, but without being washed or otherwise prepared. The blades appeared above the surface at the same time, and during the two first months of their growth there was no visible difference in their appearance. Soon afterwards many of the plants from the unwashed seed were observed to have a darker and more dirty green hue than those from the seed that had been cleansed with the water. This difference of colour, by degrees, became more striking, and increased until the grain was protruded from the blade, at which time many of the dark coloured plants evinced symptoms of decay, and the whole of them, when fully developed, were found to be completely destroyed by the smut. The plants from the washed seed produced scarcely a single diseased ear. These results were not fortuitous, for the experiment afforded a similar testimony when repeated the next season.

The experiments of Mr Harrup agree with the preceding. In these, wheat, consisting half of sound, and half of smutted grains, was sown without being previously at all prepared, and this produced a crop of which nearly two-thirds were smutted. Similar wheat, soaked for twelve hours in a saturated solution of common salt, and then mixed with quick lime, produced on the same soil, in the same situation, and in the same season, a crop in which not a smutted ear could be found. (Nicholson's Journ. xiii. 113.)

Similar, but more extended, and even more accurate experiments, were completed by Mr Bevan, and are recorded in the 9th volume of "The Agricultural Magazine." They give the results of his trials with various liquids, as steeps for seed-wheat. The wheat was grown on a sandy soil at Leighton, in Bedfordshire. The columns in the accompanying table, which are marked A, contain the results from the sound grain that was sown; and those marked B are the results from smutted samples.

LIQUIDS EMPLOYED.	Specific gravity of solution.	Number of smutted ears in three sheaves.		Bushels of good wheat per acre.		Cwts. of straw per acre.	
		A	B	A	B	A	B
Solution of potash, . . .	1.357	1	81	21.6	13.6	36.6	29.1
——— muriate of potash,	1.097	8	218	20.2	10.1	36.0	21.1
——— nitrate of potash (saltpetre),	1.080	7	115	23.8	14.3	36.9	31.9
——— soda, ...	1.056	9	159	20.2	11.7	35.6	26.7
——— muriate of soda (common salt),	1.089	—	290	24.0	14.5	41.5	33.3
——— sulphate of soda (glauber salt),	1.047	12	241	21.6	12.3	38.5	27.8
——— muriate of ammonia (sal ammoniac), .	1.026	1	150	19.8	17.6	35.4	30.2
——— common soot, .	1.025	—	123	20.8	11.4	34.8	25.3
——— lime, saturated,	1.003	—	2	21.9	12.4	38.7	25.9
——— nitric acid (aquafortis), . .	1.016	The seed treated with this acid did not vegetate.					
——— muriatic acid (spirit of salt),	1.011	—	136	20.7	16.1	35.7	34.1
——— sulphuric acid (oil of vitriol),	1.050	—	—	20.4	17.8	35.4	37.1
Dry, in its natural state,	—	6	323	20.3	14.7	35.7	31.1
Washed in common water,	—	None sown.	107	—	18.3	—	35.8

The conclusion from these and many other accordant experiments is, that washing the seed is effective in preventing the communication of the disease to the crop to which it gives birth. If the washing was frequently repeated, or the cleansing made complete, by passing a continual stream through the seed for some hours, it is probable that simple water might be employed for this purpose as effectually as any saline solution. But as this would require more labour than is desirable, and as the salts, &c. employed are beneficial in other ways, by protecting the seed from vermin, and ministering to the future vigour of the plants, *steeps* are generally and very properly adopted.

The experiments of Mr Bevan indicate that lime-water is the most effective of these preparations; and if this be adopted, it may be prepared by mixing one pound of fresh lime with three gallons of boiling water, allowing these to stand for two hours, and the clear liquor then to be poured off, and immediately used. In this liquor the wheat should be soaked for twelve hours, stirred twice or thrice during the time, and then mixed, upon a floor, with the powder made by pouring three gallons of boiling water upon five pounds of lime.

I have had no experience of the effects of lime-water as a preventive of the smut; but with stale urine and a solution of common salt, I have witnessed numerous and extensive experiments. The results, without exception, were favourable and nearly similar; and this being the case, a preference is to be given to common salt, as being decidedly the most cleanly and the least disgusting. The mode I have observed to be the most effective, is to wash the seed with pure water, pouring this off with all the floating grains, and then allowing the seed to soak for twelve hours in a solution of common salt, having a strength, or specific gravity, sufficient to float a common hen's egg.

I have no doubt that lime, like common salt, is effectual against the disease, by reason of its powerful action upon the texture of the fungus tribe. Every housekeeper knows how completely mushrooms dissolve away when sprinkled with salt; and in experiments I have made upon the *Uredo segetum*, I found that the effect of salt upon this fungus is not less remarkable.

Mr Tull, MM. de Lignerolle, Donat, and others, agree in recommending that the seed to be sown upon any farm should be frequently obtained from other soils; but, however beneficial this may be for securing other desired effects, I do not understand how it can prevent the occurrence of the smut, unless the seed is obtained from a crop and a district notably free from the disease. There is little doubt but that the mode in which the disease is imparted to the plant, is by its roots imbibing the extremely minute seeds of the *Uredo* along with the moisture of the soil. This opinion is confirmed by the observation that the disease is most prevalent when the winter has been mild, and the spring wet; for in such seasons, the abundant moisture passing through the soil is most likely to convey the seeds to the mouths of the plant's radicle fibres.

I remember trying some experiments, the full details of which I have accidentally lost, in which I buried some of the *Uredo segetum* about an inch below the surface of the soil in a garden pot in which some wheat was growing, supplying these plants, during after growth, plentifully with water poured upon the surface of the soil. Not one of these plants escaped infection. Another garden-pot in which wheat from the same sample was growing, and similarly treated in every respect, but to which moisture was supplied solely by means of the saucer in which it was placed, both pots being sheltered entirely from the rain, produced plants which were not at all infected. Although it is very apparent that the smut is generally imparted to a wheat crop by the agency of the seed sown, yet I am by no means of opinion that this is the only source of infection. I have kept ears of wheat that were covered and destroyed by the *Uredo*, during more than twelve months, in a situation where they experienced the vicissitudes of temperature during all the seasons, unprotected by more than the paper envelope in which they were suspended in an out-house. Yet when the *Uredo* that had been thus exposed was mixed with healthy, well-washed seed-wheat, this produced diseased plants in a triplicate proportion more numerous than that not so mixed. This experiment demonstrates that frost and drought, acting in concert with a damp atmosphere, do not destroy the vegetating power of the *Uredo's* seed. Such being the fact, why may not this seed remain in the soil ready to impart the plague? We know that, owing to its extreme lightness, this seed floats buoyantly in the air, and may be carried by winds to distant soils, which, in the autumn of the same year, before any extremity of cold has been endured, will have to bear the wheat crop for the following harvest. The opinion that the soil is one source of infection, is sustained by the fact that fields in the vicinity of the sea are rarely injured, and never extensively, by the ravages of the smut. Such soils are impregnated more than any other with common salt, and the effect of this saline compound upon the *Uredo* has been noticed already.

These considerations suggest that applications to the soil, as well as to the seed, are necessary for the complete banishment of the disease; but a more full notice, and some curious particulars upon this point, will have to be detailed when I am considering the rust or mildew.

I have frequently examined the roots of wheat plants affected by the smut, but have never perceived that they had a diseased appearance; a fact which I find is confirmed by the researches of Mr Kirby. Although the root is not affected, yet

I have invariably found the smutted plants of a form and habit much less robust than those undiseased. The average result of Mr Bevan's experiments is, that smutted wheat produces straw in the proportion of only 30.0 to 36.75 when compared with wheat unattacked by this disease. This is not a result contrary to that which might be anticipated, for, in plants as well as animals, an organic affection so serious as this is usually accompanied by a general emaciation of the frame. So decidedly is this effect produced upon wheat, that a practised eye can at once detect by its appearance, before the diseased ear is protruded, a plant that is thus distempered. The stem and leaves look upright, thin, and stiff, wearing the aspect that is best described, to those who know the appearance, by the term *staring*.

I cannot conclude without remarking that these facts strengthen the analogy I am so fond of tracing between plants and animals. The atrophy exhibited by both, when under the influence of disease, is strikingly illustrative of their close relationship; and this is farther carried on by their being equally liable to the ravages of parasites. The skin of every animal is liable to be infested by vermin, as its intestines and other viscera are by worms and various other creatures. So plants are not only subject to invermination, but, like animals, they are preyed upon by various genera of their own race. Their barks are assailed by numerous lichens and fungi; whilst internally they are a prey to the uredo I have just described, and to several others of the fungus kind.

Animals have their larger parasites, as the tick, &c.; and vegetables similarly bear the missletoe, dodder, and others.

This repeated urging that plants are closely allied to animals in every particular, is not without its use. Every year's experience convinces me that it is not less beneficial to cultivate plants with the least possible injury to their various parts, than it is to treat our farming-stock with gentleness and an attention to their comfort; and it is by demonstrating the analogy between the two great divisions of created beings, that the reason of the cultivator is to be drawn to regulate his practice.

Finally, I will observe, that the farmer is much too prone to regard the diseases of his crops as of trivial importance. In such cases, as where the curl destroys whole fields of his potatoes, or the mildew reduces the produce of each acre of wheat to a few bushels, he is miserably sensible of the injury he has sustained; but if, within the circle of corn-ears around him as he surveys his crops, he only sees a sprinkling of those affected with the smut, he looks upon this as of insignificant consequence. Yet, in the experiments of Mr Bevan, in the instance where only two smutted ears occurred in three sheaves, the weight of the straw was reduced nearly one-third, and that of the grain three-sevenths.

ARBORETUM BRITANNICUM.

Arboretum Britannicum, or the Hardy Trees of Britain, Native and Foreign, pictorially and botanically delineated, and scientifically and popularly described, with their Propagation, Culture, Management, and Uses in the Arts, in useful and ornamental plantations, and in landscape gardening; preceded by a Historical and Geographical Outline of the Trees and Shrubs of Temperate Climates throughout the world. By J. C. Loudon, F. L. H. G., and Z. SS., &c. 8vo. London: Longman & Co.

This splendid work is now published, and displays extensive research, judicious arrangement, and eminent practical skill in the indefatigable and talented author. It forms by far the most complete work on the interesting subject of Arboriculture that has hitherto appeared in this, or (as far as we know) in any other language.

It will be admitted by the generality of arboriculturists, that few have any thing like a complete knowledge of the various trees in public nurseries, which have from time to time been introduced to this country, and which are suitable to its climate; nor is there any standard work sufficiently explicit to which the planter may refer for guidance in selection of trees, or whereby he may learn their different characteristics, their adaptation to forest or landscape scenery, progress of growth, general appearance, uses in the arts, average price in public nurseries, and other particulars connected with their selection, culture, and management. All this, and much ı is now amply supplied by the work under review, by num elegantly engraved portraits of young and old trees and distinguishing characteristics, illustrated by upwards of well executed wood-cuts, with accompanying concise and spicuous explanatory letter-press, sufficiently plain to ; the veriest tyro in arboriculture, and interesting and ı to the most accomplished practical planter.

The first part of the work gives a " general outline c history and geography of the trees and shrubs of temp climates ;" and, as it is allowed on all hands that a know of the history of father-land should take precedence of of every other, the author, after a brief notice of the k ledge of trees and shrubs among the ancients, gives a ' tory and geography of the trees and shrubs now in the Bı Islands."

According to Gerard, Daines Barrington, and Walker, only indigenous evergreen trees are the Scots pine anc holly, so that we are thus reduced to two evergreen tree four evergreen shrubs, viz. the juniper, the spurge laurel butcher's broom, and the ivy, unless we include such ı shrubs as the heath, the andromeda, the uva ursi, &c., v do not generally attain the height of two feet."—(p. 24.) box, and even the furze or whin, are supposed to have been i duced from abroad. The reasons assigned for the whin l of foreign extraction, as flowering in winter, and being sionally killed down to the ground by severe frosts, see least plausible. The yew, too, is rejected as a native, alth certainly the yew tree at Fortingal, as figured in Penn Tour, shews that it has been growing in the Highlan Scotland at a very early period ; and Mr Loudon seem villing to relinquish its being indigenous. " The yew, says, " is found in inaccessible acclivities, and other p where it must have been sown by birds. . . . There its being a native cannot reasonably be doubted, excej something like positive evidence."—p. 26.) The list of duous trees " known to our Saxon ancestors" seems to been extremely short, consisting of only " the birch, alder, wild or Scotch pine, mountain-ash or rowan-tree, juniper, elder, sweet gale, dog-rose, heath, St John's wort, and the missletoe."—(p. 26.) By the exertions of various collectors, this meagre list has been wonderfully augmented within the past three hundred years; and, in narrating the success of each collector, the author pays a well-merited compliment to the late Mr David Douglass, whose exertions contributed, in a remarkable degree, to enhance the beauty of our flora, and, it may reasonably be expected, to the value of our forests. " The plants introduced by Mr Douglass," he says, "are supposed to be more numerous than those introduced by any other individual whatever; and what greatly adds to their value is, that, being from a temperate region, they will all endure the open air in this country. The number of herbaceous species which he introduced amounts to nearly 100, and of trees and shrubs to 50."—(p. 124.) To the memory of this distinguished botanical collector a monument is about to be raised in or near his native village of Scoon, Perthshire, by subscription, and it is highly creditable to Mr Loudon to have become the *most zealous*, and, hitherto, *by far* the most successful agent in forwarding the subscription.

It will appear, from the following statement, that botany has, in its effects, kept pace with what is called the " march of improvement." The introduction of trees and shrubs into the British islands are, " in the sixteenth century, 89 ; in the seventeenth, 131; in the eighteenth, 445; and in the first three decades of the nineteenth, or from 1800 to 1830, 699. The total number of foreign trees and shrubs introduced up to the year 1830 appears to be about 1300. It would thus appear, that nearly half the foreign trees and shrubs in the country have been introduced during the present century, and these have been brought chiefly from North America."—(p. 126.)

" France, from its extent, and warmer climate of its southern provinces, and the varied character of its surface, including as it does some of the highest mountains in Europe, and a portion of the shores, both of the Atlantic Ocean and the Mediterranean Sea, contains the richest indigenous ligneous flora of any country in Europe."—(p. 132.) Her botanists also seem to cope with those of Britain in their introduction of foreign trees, shrubs, and minor plants.

Belgium and Holland can boast little of their indigenous arboretum. The intensity of the cold in Germany during the winter months, kills many plants down to the ground which with us are quite hardy. The common portugal, and even the spurge laurel, require protection. The holly, the box, and the laburnum, spring up from the root after they are killed down to the ground. These are plants which seldom are hurt by the severest frosts which occur in Britain, but on many parts of the continent the temperature frequently falls 20° below zero of Fahrenheit. It is rare that it falls to zero in this country. Last winter, indeed, it fell in some places a degree or two below that point, and hundreds of plants that were thought acclimatised have perished. In the Russian empire, "the Crimea, the mountains of Caucasus, the Circassian Alps, and the shores of the Caspian and Black Sea, are rich in the productions of warmer climates, and hence the number of species that Russia possesses not indigenous in Britain, are considerable" (p. 155); and it appears we are indebted to that part of the Russias for many of the trees and shrubs which adorn our pleasure grounds. Switzerland, the native country of our larch, presents the botanist with a large and interesting variety of trees and plants. The ancient lime-tree at Fribourg, and that at Trons in the Grisons, are preserved as monuments of remarkable events in the history of that romantic country. The well-known and justly celebrated M. De Candolle has added much to the knowledge of vegetable physiology, and stimulated his countrymen in increasing the Swiss arboretum. The lists of trees peculiar to Asia, Africa, Australia, and America, are extensive and interesting, and every year adds to the list of plants introduced from the more temperate of these climates. A list of authors who wrote on the history of trees and shrubs, with remarks, and a concluding summary, furnishes part first of the work.

Part second treats "of the science of the study of trees;" and here the landscape-painter, the landscape-gardener, and the botanist, will find much interesting matter. The reader of the Arboretum Britannicum should peruse this part with much care, to enable him to understand clearly the subsequent or third part of the work, " *or the description, history, properties, and uses of the hardy trees and shrubs of Britain, indigenous and foreign*," which commences at page 231, and which, to the practical planter, forms the most interesting part of the work. The natural system is adopted in the arrangement, for which the author gives the following satisfactory reasons:—" It may suffice to say in favour of this system, that, by grouping together objects which resemble one another in the greatest number of particulars, and which are also most alike in their qualities, every thing which is known respecting the properties, uses, or culture of any one of them, may be inferred, in a great measure, of every individual in the whole group."—(p. 211.)

The order Magnoliaceæ, including the different species of Magnolia and Liriodendron, with their sub-varieties, contains many interesting plants. The well-known *Magnolia grandiflora*, " found in the forests of America from North Carolina to Louisiana, is there a tree from 60 feet to 100 feet or upwards in height; but in Britain is chiefly to be considered as a wall-tree." On a wall in the Edinburgh Botanic Garden it appears, from the " Statistics" of this plant, that it is twelve feet high, the highest, as recorded in this work, of any in Scotland. The highest in England appears to be at Powdersham Castle, and Coombe near Plymouth. This plant, as standards there, measures 30 feet in height. " Price of young plants in pots in the London nurseries, 3s. 6d.; seeds in New York, 9 dollars per quart."—(p. 267.) The *Magnolia tripetala*, a common plant, and one which has stood the severe frosts of last winter in the Kinnoul nurseries, Perth, resisting a temperature of 5° below zero, as a standard, shews its adaptation to the colder districts of this country. In its native country this plant seldom exceeds 35 feet, and in many instances it attains the same height in the British isles.

The tulip-tree, *Liriodendron tulipifera*, is found as far north as the southern extremity of Lake Champlain, in latitude 45°, and abounds in the middle states, Kentucky, &c. The largest tree of this sort in England appears, from the Statistics, to be at " Hester-Comb, in Somersetshire, 96 feet high, with a trunk nearly three feet in diameter. In Scotland, at Hopetoun

House, two trees, eighty-six years planted, and 60 feet high; at Gorthy, Perthshire, two trees, 40 feet high. The highest noticed in Ireland is at Shelton Abbey, and 60 feet high. In the London nurseries, seedling plants are 12s. a hundred; in New York, seeds are 4 dollars and 30 cents. a bushel."

Of the genus Acer (Maple), 19 species are described, and the different leaves of the most shewn by wood-cuts.

The leaf of the *Acer macrophylla* is figured, and is unusually large. "Specimens of the timber which were sent home by Mr Douglass, exhibits a grain scarcely inferior in beauty to the finest satin-wood. Douglass prophetically says, it will at some future time constitute one of our most ornamental forest-trees in England. This magnificent species cannot be too warmly recommended to the attention of planters. In the nurseries it produces shoots from six to ten feet in length. Plants in London cost 2s. 6d. each."—(p. 408.) "The largest specimen of the tree is in the Horticultural Society's Gardens, where, in 1835, it had attained the height of 25 feet."

The *Acer rubrum* is a highly ornamental tree, and its cultivation in the lawn should be much extended. "Whether we regard the beauty of its flowers and opening leaves in early spring, of its red fruits in the beginning of summer, or its red foliage in autumn, it deserves to be considered one of the most ornamental of hardy trees."—(p. 427.) "In Surrey, on an eminence in the arboretum at Milford, there is a tree forty feet high, which in autumn, when the leaves have assumed their dark red colour, looks like a column of scarlet, and is seen from a great distance all round the country. In the Perth nursery one fourteen years planted is twenty feet high. Plants in London cost from 1s. to 1s. 6d. each."

Between the North Bridge and Earthen Mound, in front of Prince's Street, Edinburgh, a number of the *Acer pseudo-platanus* have been planted in the banks to the north and south of the ground under nursery between the old and new towns, and the plants seem to thrive. In place of a heterogeneous mixture of all sorts of common hardy trees in such a place, which viewed either by the practised or unpractised eye, can afford no pleasure to the mind, would it not be much better that such banks within Modern Athens were laid out like an arboretum, containing specimens, allowed to assume their natural form, of most part of the hardy trees that would prosper in that climate, and in the smoke of Auld Reekie? The Acer would form one very important genus, the Quercus, the Fraxinus, the Cratægus, the Tilia, the Ulmus, and other hardy forest trees, with all their species and subvarieties (the genus pinus or abies we fear would not succeed) would form a very interesting collection to the botanical or arboricultural student, and prove an ornament worthy of the city and of the present age. With such eminent men in the Town-Council for taste and botanical research, as we could name, were it not thought invidious, we are surprised that something of this nature has not long since been attempted.

Amongst arboriculturists the genus Pinus has of late excited considerable attention, and in a work like the Arboretum Britannicum, it was to be expected that it would occupy a considerable portion of its pages; accordingly, independent of the kindred tribes of *Abies picea* and *Larix*, the letter-press and illustrative wood-cuts descriptive of pines fills 141 pages.

> "In studying this genus, and arranging the kinds according to their buds, cones, and leaves, we consider *P. sylvestris*, *P. laricio*, *P. pinaster*, *P. pinea*, *P. halapensis*, and *P. cembra* as the principal European species, and the other European kinds as only varieties of them. *P. australis*, *P. taeda*, *P. Banksiana*, *P. inops*, *P. pungens*, and *P. strobus*, we consider as the principal species of North America. *P. Sabiniana*, *P. ponderosa*, and *P. insignis*, are the principal species of California. *P. Lambertiana*, and *P. monticola*, also from California; and *P. excelsa* from Nepaul, appear to be only varieties of *P. strobus*. The most remarkable species from Nepaul is *P. Gerardiana*, which has straight stiff leaves like those of *P. pinea*, but with caducous sheaths." (p. 2151.)

Of the *Pinus sylvestris* or Scots fir, there are several varieties described. Those most in favour with planters of the present day are *Pinus sylvestris horizontalis*. Some excellent and very distinct specimens of this justly esteemed variety are to be met with at Lawers, near Crieff, Perthshire; two fine trees stand at Seggisden, Carse of Gowrie; and numbers are interspersed through the Highland forests. The late Lord Balgray shewed us a plant of this variety measuring 5 feet 1 inch in breadth, and very little sap-wood on the outside. The variety *horizontalis* is now receiving an extensive cultivation, it is supposed to be less liable to rot or early decay while standing, than the common Scots fir.

The author, Mr Loudon, sent some seeds of the *Pinus sylvestris haguensis* to Perthshire in 1829. They were sown in sandy soil in the parish of Kilspindie, and appear more vigorous than the common fir; the young wood is easily distinguished by a greenish-yellow colour. Young plants of this excellent variety are now to be had in several nurseries at moderate prices.

The Oak, the king of the forest, is treated of at great length, and this would form a very interesting volume by itself. The illustrative wood-cuts are numerous, and splendidly picturesque. The description and figures of insects, mosses, and fungi that infest the oak, occupy 21 pages. The wood-cuts, besides the plates connected with the oak, amount to 308, and the letterpress occupies 234 pages.

Several instances are given of the durability of the oak, amongst which we notice the " Shrine of Edward the Confessor, 800 years old; and one of the oaken coronation chairs has been in its present situation in Westminster Abbey about 540 years; and of the durability of oak timber, the oldest wooden bridge of which we have any account, namely, that one famous for its defence by Horatius Coclis, and which existed at Rome in the reign of Ancus Martius, 500 years before Christ, might be given as another example." (p. 1748.) The enormous size to which some oaks have arrived, appear as extraordinary as its durability. Portraits are given of some of the following largest oaks still existing:—

> "These appear to be the Salcey Oak in Northamptonshire, with a trunk of 46 feet in circumference; the Grindstow Oak in Surrey, 48 feet; the Hempstead Oak in Essex, 53 feet; the Martin Oak in Norfolk, 63 feet; and the Cowthorpe Oak in Yorkshire, 78 feet; the Threeshire Oak, near Worksop, was so situated that it covered part of the three counties of York, Nottingham, and Derby, and its branches dripped over 777 square yards."

From these gigantic specimens we now look nearer home, and give an extract from the Statistics for Scotland of this noble national plant.

> " *The British Oak in Scotland.*—In the neighbourhood of Edinburgh, there is an oak in Dalmeny Park 70 feet high, with a trunk 15 feet 6 inches in circumference, diameter of the head 96 feet; another oak 70 feet high, has

a trunk only 6 feet 5 inches in circumference, but carries nearly that thickness to the height of 30 feet before it throws out branches. At Barnton Hall is an oak 80 feet high, with a trunk 11 feet in circumference, and a head 82 feet in diameter; the trunk is sound, and without branches to the height of 20 feet, but the head is stag-horned and much decayed. At Hopetoun House is a growing tree 75 feet high, with a trunk 11 feet in circumference. At Melville Castle is an oak 70 feet high, with a trunk 18 feet in girt, at 4 feet from the ground, and a head 90 feet in diameter. South of Edinburgh.—In Ayrshire, at Kilkerran, it is 50 feet high; the girt of the trunk is 12 feet 6 inches, and the diameter of the head is 90 feet. In Haddingtonshire, at Yester, is an oak 89 feet high, with a trunk 12 feet in girt, and a head 70 feet in diameter. In Lanarkshire, at Bothwell Castle, is an oak 59 feet high, with a trunk 14 feet in circumference, and a head 98 feet in diameter. In Roxburghshire, at Minto, are several oaks about 200 years old, which are 70 feet high, the girt of the trunk about 12 feet, and the diameter of the head 63 feet. North of Edinburgh.—In Aberdeenshire, at Fintray House, are four oaks with trunks varying from 5 feet 6 inches to 8 feet 10 inches in circumference. The oak does not ripen its acorns, and rarely its young wood in this country. In Banffshire, at Gordon Castle, is an oak 66 feet high, with a trunk about 10 feet in girt, and a head 66 feet in diameter. In Cromarty, at Coul, there is an oak 162 years old, which is 80 feet high, the circumference of the trunk 12 feet, and diameter of the head 60 feet. In Fifeshire, at Donibristle Park, it is 70 feet high, with a trunk about 11 feet in girt, and 40 feet clear of branches, diameter of the head 45 feet. At Largo is an oak 100 feet high, with a trunk 9 feet 6 inches in circumference, and 35 feet clear of branches, and a head 53 feet in diameter. In Forfarshire there is an oak on the estate of Lord Gray, at Gray House, which was 68 feet high, the circumference of the trunk 17 feet 6 inches, and the diameter of the head 90 feet when it was measured in June 1836 by Mr Robertson, his lordship's gardener. The same oak, when measured in 1821, was, we are informed by Mr Robertson, then only 16 feet in circumference, and consequently it has gained 18 inches since that period; it is *Q. pedunculata*, and is in great health and vigour. In Perthshire, at Taymouth, is a growing oak 45 feet high, with a trunk 14 feet in girt, and a head 72 feet in diameter. The tree stands in the park in a loamy soil, on a dry subsoil, and is about 100 years old. In Ross-shire, at Brahan Castle, is an old oak 80 feet high, with a long straight trunk 12 feet in circumference, and a head 90 feet in diameter. In Stirlingshire, at Blairdrummond, is a growing oak 120 years old, 86 feet high, with a trunk 20 feet in the bole, and 14 feet in circumference, diameter of the head 60 feet. There are many fine oaks at Blairdrummond from 15 feet to 50 feet in the bole, but no other is quite so much in circumference. In Callender Park *Q. sessiliflora* is 50 feet high, the circumference of the trunk 15 feet 6 inches, and diameter of the head 58 feet. In Sutherland, at Dunrobin Castle, is an oak 80 feet high, the diameter of the head 47 feet, and the girt of the trunk about 11 feet." (p. 1841.)

Our arboricultural readers are aware that there are two nearly allied species, or as some say varieties, of the common oak, viz. *Quercus pedunculata* and *Q. sessiliflora*. The former is found most easy to split, and the stiffest and the easiest to break, and yet the most difficult to bend; while the latter has the advantage over the others in toughness and weight. The following comparative view is from Hartig, of the *Q. pedunculata*:—

	lb.	oz.
The wood of which when green weighs (we suppose per solid foot)	78	13
.... half dry,	65	9
.... perfectly dry,	52	13

and of the *Q. sessiliflora*,

The wood when green weighs	80	5
.... half dry,	67	12
.... perfectly dry,	51	10

While we trust the few extracts we have given may prove interesting and acceptable to our readers, we are aware that we have failed to convey to them any idea of the nature or value of the work; a work which we consider indispensable to every land-proprietor, land-steward, and forester, who may wish to lay claim to the appellation of planter, and where he will find much that is original, combined with all that has been written worthy of perusal up to the present time on the subject of arboriculture,—a subject we are sorry to be compelled to say is but ill understood, and worse practised, in instances too numerous throughout the British isles.

A. G.*

THE AGRICULTURIST'S NOTE-BOOK.—NO. III.

Improvements in Thrashing Machines.—The moving powers of thrashing machines are obviously so unlike, that they cannot be mistaken for each other. Horses, water, steam, and wind, and the modes of applying their powers to thrashing machines, are as unlike as things can be. But the construction of that part of all thrashing machines which separates the straw and chaff from the corn, and from each other, is, on the other hand, so very similar, that a person unaccustomed to observe the great difference in the thrashing and cleansing properties of that part of the machine, might naturally conclude that all thrashing-machines of the same power execute the same quantity of work in the same time. In construction they all have a drum, shakers, and fanners, moved, it is true, by slight modifications of gearing, but evidently so similarly constructed as to be intended to produce similar results.

---

* We are indebted to Mr Gorrie for this notice of the Arboretum, as we have never had an opportunity of seeing the work.—Editor.

No conclusion, however, can be more opposed to fact than this, for thrashing-machines of the same power and construction perform very different quantities of work. Whilst one machine only thrashes 24 bushels of oats in the hour, another of the same power thrashes 60 or even 72 bushels. We have known as great diversity of work performed, and have heard of greater. What would be thought of machines, of professedly similar power, producing so diversified results in any branch of manufacture, we know not; but this we do know, that farmers, generally, feel very little uneasiness regarding either the quantity or the quality of the work performed by their thrashing-machines. They are content in possessing one of any capability. Of course, they consider it requisite to have thrashing machines, but they bargain for the cheapest, and cheerfully pay its stipulated cost, though it should only perform the lowest rate of work. Nay, we have frequently observed that they consider their own judgments implicated in possessing such machines, when animadversions are made on the quality of the work performed by them. The truth is, millwrights themselves cannot foretel what the machines they make can perform, till they are tested; and although they should turn out inefficient in the trial, the bulk, cost, and fixedness of such machines, prevent their being thrown on the maker's hands. The makers endeavour to rectify manifest and egregious errors committed in the construction; but errors committed in the relative velocities of the larger gearings of ponderous machines, can never afterwards be satisfactorily rectified. The most usual amendment of such errors is a proportional reduction in the price, and the machines are retained and made the best of as bad bargains. However displeased farmers may be at being thus obliged to retain clumsy and ill-constructed machines, they are nevertheless very scrupulous of exposing their faults. So long, therefore, as farmers continue indifferent about the working powers of their thrashing-machines, so long will millwrights continue to supply them in an inefficient state.

But what is the cause that thrashing-machines are generally made in an inefficient manner? Partly from the general condition of country millwrights, and partly from the desire of farmers to procure them at the lowest price. Most thrashing-machines are made in the country, and most millwrights in the country are known to be men of very limited capitals. They cannot afford to supply themselves with complete sets of patterns applicable to the various moving powers, in all the peculiar circumstances of localities. One may have patterns for a good water-wheel, adapted to a large supply of water; another those of a horse-wheel; and a third may possess patterns for the thrashing portion of a mill; but very few, if any, possess patterns for a complete thrashing-machine. If the first-mentioned millwright is desired to erect a machine for a small supply of water, and the second one for weak horses, neither of the patterns will answer those circumstances, nevertheless, both will be used as they are. To complete machines, millwrights are in the habit of borrowing patterns from each other; and it is also customary for iron-founders to give the use of their patterns of the heavy castings. Thus put together by pieces brought from various quarters, and of course unadjusted with the requisite nicety, there is no wonder that thrashing-machines usually exhibit inefficient capability for work. Were the formation of their component parts by different hands, an exemplification of the principle of the division of labour, as is the case with the component parts of watches, thrashing-machines might soon become, like watches, perfect in operation. There are well understood conventional sizes of all the parts of watches of different sizes fixed by the trade, and when those parts are put together by one hand, though they may have been made by many, they produce perfect machines, whose minute-hands make a revolution round the dial every hour, and hour-hands one in every twelve hours, as precisely as if the whole parts had been made by the same mechanic. In like manner, were the component parts of thrashing-machines calculated for the extent of power fixed upon, and the work to be performed; and especially, were all the heavy wheels not only pitched to truth, but chisseled with accuracy, they could not fail to produce precise results which may be truly anticipated.

We know of no practicable mode of attaining this perfection, but by fixing standards of sizes for the component parts of thrashing-machines of given powers, such as for a four-horse, six-horse, and eight-horse; and we know of no practicable mode of fixing those standards, but by ascertaining, in the first instance, the largest quantities of work, performed in the best manner, by machines of those different powers actually in use. We have no doubt excellent machines do exist in the country, though there may not be one incapable of emendation. We have seen one, though not at work, which was represented to thrash ninety-six bushels of oats in the hour, with six horses. We knew a machine of that power, propelled by wind, which thrashed that quantity in a very windy day, when the brake had no power to stop the arms, and the gearing had lost the power of reefing the sails. We also knew a horse-machine which thrashed nineteen crops without incurring a farthing of expense for repairs. On the other hand, we have seen a water-machine, quite new, which never could thrash more than thirty bushels of oats in the hour, and even to do that, required a much larger head of water than the millwright stipulated for, and scarcely a time was it used but something broke or went wrong.

If the thrashing capabilities of the machines of different powers in greatest repute in the country were ascertained, and the *measurements of all their component parts carefully marked down*, data would be afforded which would enable country millwrights to make machines of superior powers to any in use. The most practicable mode of obtaining statements of work, we conceive, would be by members of local agricultural associations collecting facts, such as have been suggested, regarding the best thrashing-machine in their respective districts; and the statements containing the highest results, could be transmitted to the Highland and Agricultural Society, who, in choosing the most favourable case out of those statements, might either request some proprietor to construct a machine similar to it, but avoiding its acknowledged faults, if any there were, or cause experiments to be made with the machine on the farm on which it was reported to be on, at different velocities, and with different kinds of grain, under the superintendence of competent persons; and after the alteration suggested by those experiments were fully ascertained to be real improvements, patterns could be made from the approved machine, and a full set of them of the various powers kept by every local agricultural association in the country, for the special use of country millwrights, who should be obliged to use them. The set of patterns kept by the Highland Society would be the standard one for reference. In this manner complete sets of patterns of the most approved construction of the thrashing-machine would be within the reach of every farmer, and it would be their own faults if all machines were not equally good, and extensively distributed throughout the country.

Those farmers who are content with the capabilities of the thrashing-machines presently in use, may not appreciate the expediency or necessity of those suggestions for their improvement; but if by those improvements time be gained in thrashing every stack of corn, the most irksome labour they can be put to on a farm made easier to the horses, water saved in situations where it is naturally scarce, and fuel economized in places far removed from sea-ports and collieries, a great boon would be conferred on those easy-minded farmers, despite of their unwillingness to assist in its accomplishment.

Railways and Agriculture.—Landowners have frequently and broadly been accused, in opposing some of the railway schemes which are so rife in the present day, of retarding the improvement of the country, and opposing works of national importance. Such accusations seem peculiarly misdirected against those who have done more to draw forth the resources of the land, and beautify the appearance of the country, especially within the few last years, than any class of people in the kingdom; and they come with a peculiarly bad grace from those who are daily employed in covering over improved land with rubbish, circumscribing the field of produce, and marring the picturesque beauty of the country with huge mounds of earth. For, although it is undeniably true that the chief portion of the labours of land-improvement has been performed by tenants, yet, unless landlords had consented to their execution, they could not have been executed, nor even undertaken, to the extent they have been; besides, plantings, buildings, and ornamental improvements have been promoted by landlords themselves. There is no danger, then, in giving a flat denial to those sweeping accusations against landowners.

Indeed, it is admitted, in an agricultural sense, that landowners have promoted schemes of great improvement, but still it is alleged against them, that they oppose the extension of railways, as acknowledged works of national importance. This allegation requires examination. And, in the first place, have landowners had no cause to complain of the overbearing and reckless manner in which railways have frequently been attempted to be pushed through any part of their properties, regardless of established comforts and privacies? When landowners prosecute their improvements, and thereby endeavour to increase their substance, they do so *upon their own properties*, without disturbing those of their neighbours. This being the case, railway projectors, in endeavouring to secure large per-centages for their capital, should, in the first instance, consider that they have *no properties of their own* upon which to project their schemes, and that, before they can even attempt it, they must acquire the properties of others, who, probably, are most reluctant to part with them. This consideration justifies the reasonableness of the opposition which landowners raise against their schemes; and although such an opposition need not prevent them pursuing their speculations keenly, it should teach them their dependence on the good-will of landowners, which it is more their interest to conciliate than to irritate. In common fairness, why should landowners be *obliged* to dispose of a part of their properties, and submit to an everlasting nuisance, to please any species of speculators? What damage has not actually been done by railways to landed property? Lawns have been bisected, and railways have been made to pass through the most conspicuous parts of them. Depots of coal, lime, and fulzie, have been erected directly opposite to the drawing-room windows of mansion-houses. Railways have cut through and passed below gardens and approaches, and in their course have swept away walks and shrubberies; they have been shot within short distances of mansion-houses; porters' lodges have been annihilated by them at the side of public roads, and at the ends of avenues, and embankments many feet in height have been substituted in their places. Rivulets in which cattle used to water, have been cut off from fields; long mounds have been raised up for them to run upon, parallel to rivulets or roads, and which have detached strips of cultivated land, and rendered them unfit for cultivation ever after. Cuts of upwards of twenty feet in depth have been made for them close beside farm-houses; mill courses and dams have been destroyed, and others have been turned away in inconvenient directions. No pecuniary compensation whatever can recompense landowners for the infliction of such annoyances.

When all these annoyances, and many more such like, have been threatened to be perpetrated, both in England and Scotland, is it not natural in landowners to attempt their prevention? If a threatened nuisance is not opposed before it is established, it is folly complaining of it after its permitted establishment. It is thus upon the ground of annoyance chiefly that most landowners have been opposed to railways; and those who are road-trustees may have opposed them on the additional plea of injuring the traffic on the highways committed to their charge. But no matter what the grounds of opposition are; for, if at all opposed to railway schemes, landowners are declared guilty of the heinous crime of opposing works of national importance. This assumed maxim is reiterated abroad with all the force and solemnity of authoritative truth. Are landowners, therefore, obliged to believe that railways, as presently conducted, are in reality works of national importance? On the contrary, are not the most useful of them mere private speculations, instituted solely with the view of producing a large per-centage on expended capital? Since this is notoriously the present condition of all railways, are not landowners as justified in protecting their properties from damage, after having improved and beautified them with much trouble and expenditure of capital, by resisting the intrusion of railways, if they consider them nuisances, as railway speculators, in prosecuting their intended schemes, regardless of disruption into private property, and the disturbance of secluded retirement? Landowners are nevertheless as much alive to national improvements as other people; and if it could be demonstrated to them that railways would materially benefit their properties, by facilitating the transport of produce to markets of large consumption, without committing corresponding injury, they would readily avail themselves of their services. But, as matters are, whenever we see landowners opposed to any projected line of railway, we may safely conclude that that particular line will inflict more injury than confer benefit on their properties.

But are railways of greater national importance than public roads? Of the two means of conveyance, the road is the more generally useful, being patent at all times to all the world of travellers. The cross-roads may be travelled on at all times without charge, and the turnpike roads are as free on payment of toll. They thus both exhibit a strictly public and national character. But no one can insist on travelling on a railway, without first obtaining the consent of the proprietors. No one can command the transport of his goods, or the employment of his own carriages on a railway, but by special license of, and payment of dues to, the proprietors. Nor can one man's goods, however urgent his case, be transported at a greater speed than those of others. In like manner, no one can insist on his corn being ground at any particular mill, without the consent of the miller. A mill and a railway are thus similarly circumstanced in regard to the public; and both are strictly private property. It is no doubt the interest of the railway proprietors to invite and encourage the transit of goods and passengers on their railways, as it is that of the miller to secure as much corn as he can obtain to be ground at his mill. The exclusive rightship was strictly the condition of the first railways that were opened in England. Since then, we believe, they have been declared to be public highways. Still, from their nature, they are as much under the control of their proprietors as ever, and not a bit more free than stage-coaches; but neither are so accessible to private use as turnpike roads. In one sense, then, roads possess more of the character of nationality than railways, and in every respect they are more useful; for roads insinuate themselves in every direction, and to every place. They surmount every difficulty of ground, and enter every field. Not so with railways, for straight lines are most suited to economy in their construction, and level lines for expedition of transit; whilst numerous curvatures in them are dangerous, high declinations insurmountable, and fields at all times inaccessible to them.

We have insisted the more on these peculiarities of railways, because we think it is they which have prevented railways being so useful to agriculture as common roads. The most easy accessibility to railways does not dispense with any animal labour on most farms. At a short distance from the market-town, as far perhaps as five miles, it is as economical to carry burdens with farm-horses, as to pay the dues of a railway. In winter, when horses have little else to do than to plough, and lead out manure, it is thriftier for a farmer to drive his corn to market on his own carts, than to take it a short distance to a railway depot, and pay the railway dues. When corn is delivered by railway, a trusty person must be sent with it, to deliver it by hired cartage from the depot to the granary of the corn-merchant, be satisfied of the quantity delivered, and bring back the sacks. The same motives impel millers to employ their own horses, which they constantly employ in lifting corn from their customers, and delivering the meal after it is prepared. So far therefore are railways, as at present conducted, from being works of national importance, they are not only strictly private speculations, but in the truest sense monopolies, which moreover threaten soon to become huge monopolies of the conveyance of the country; and although they should eventually supersede the great traffic on roads, they can never become universally convenient to farmers. A workable steam-locomotion on the common roads would be a greater boon to agriculture than any railway.

In making these strictures on railways in relation to agriculture, our main object has been to vindicate the reasonableness of the opposition of the landed interest to the indiscriminate extension of railways; and to do this there seems no more obvious way, than by shewing the inutility of railways to agriculture, compared with common roads. This we have endeavoured to do. In certain circumstances, we admit, railways are beneficial to agriculture, and there is no doubt they have had an extraordinary influence in altering the relative values of land. One of the circumstances to which we allude, is their acknowledged and felt benefit to extensive agricultural districts, far removed from the conveniences of a sea-port, by affording an easy transport for produce. From such distant situations, the time spent in performing long carriages with produce on common roads, is of greater value to the farmer than the amount of dues exacted for conveying the produce on railways; besides, in performing long journeys with produce, and in returning loaded with necessaries for a farm, such as coal, lime, or manure, horses are much more injured than by employment for the same time on the farm. The nearest railway depot is therefore the best point of delivery for farm commodities, in such large and isolated agricultural districts as Strathmore, the nearest farm in which is situated eleven miles from the sea-port of Dundee. The Newtyle railway, in conjunction with those of Coupar-Angus and Glammis, has in this way conferred much benefit on this important district. In saving long carriages, those farmers in Strathmore who kept five pairs of horses have been enabled to reduce them to four. The county of Roxburgh is another large isolated agricultural district, together with Lauderdale in Berwickshire, which would be much benefited by a railway to the sea-port of Berwick-upon-Tweed. The carriage at present from this district with produce, and the return with coal and lime, cannot be performed with less labour for men and horses than two ordinary days' work. An attempt was made to form a railway company on this line, but it has been unsuccessful, no doubt from the dreaded probability of the transit of agricultural produce alone not being sufficient to pay a dividend on the outlay; and the population in that part of the country not being so dense as to induce to the belief of a great concourse of passengers.

Railways are also favourable to agriculture, in encouraging and affording facilities for conveying certain produce to towns, which would otherwise never have been conveyed. It is no uncommon practice now to send daily from distant parts of the country clover and turnips to carters and cowfeeders in large towns. These things fetch much cheaper rates at some distance than in the immediate vicinity of towns, and at higher rates, and with a steadier demand, than the usual country prices. The pressure of demand being thus removed from the vicinity of towns, the prices of produce have there fallen. The fall, however, is not quite in a proportionate degree to the increased supply; for the food of live-stock is always of better quality in the neighbourhood of towns than at a distance, because of the greater fertility of the soil.

In this manner the rents of land have become more equalized along the whole districts traversed by railways, the immediate vicinity of towns still retaining the advantage, because it affords shorter carriage, more facility in lifting the produce, and the produce is always of better quality. So sensibly is this effect on rents felt by landowners, that when an extensive proprietor in the neighbourhood of Dundee was requested to take shares in the Newtyle railway, he shrewdly answered, that "he had more sense than to assist in bringing Strathmore to the neighbourhood of Dundee, to compete with his own land."

Poor land is improved by a railway passing through it. The land on both sides soon becomes occupied by labourers, whose occupation is weaving, but who also cultivate the small patches of ground around their dwellings, the railway bringing manure to their hand; and although cottagers of such mixed character and pursuits do not perhaps form the best class of peasantry, yet their temperate and moral habits are fully better than the mechanics of the same class inhabiting large towns; but they are only better when kept scattered over a large extent of country, for when allowed to congregate in extending villages, their characters and habits are not a whit better than those in large towns. There was a time when landowners were anxious of establishing villages on their properties, in order to command the services of field labourers; and, to induce the villagers to build their own houses, very long leases, or perpetuities, or what are called in this country, feus, were granted of the ground upon which they were to build. So long as the character of the villagers was rural, they formed useful, and desirable labourers; but now that they have betaken themselves to employment from the manufacturers in towns, their character has undergone a complete change, being quite regardless of field-labour, and preferring a long day's confined labour at the loom to a short day's healthy occupation in the fields. The inconvenience to field-labour on this account would not be so much felt, were the men alone to confine themselves to weaving, for it is only at the corn-harvest that their services are required; but women also weave, and they also prefer the long and irksome daily treading at the loom to short hours in the fields. They of course earn more at the loom than in the field. This being the actual state of things, many landowners have repented encouraging the extension of villages on their estates.

An enclosed and richly cultivated country, if not positively injured, is not benefited by the passage of railways through it; because the usual high rent of rich land presents no temptation to labourers to settle themselves, by building houses and improving the land. The probability is, the land would become less fertile under the high rent with their management; and there is positively a permanent loss of produce from every acre of good land occupied by railways.

Were the subject of railways taken up by the legislature in a truly national spirit, the landed interest would willingly second any proposal that would confer on railways a national importance, as keenly as any other interest in the kingdom; but it is too much, under present circumstances, to expect acquiescence in their properties being cut and carved to suit the avarice, whim, or it may be malice, of a few speculators in railway shares. To insure the co-operation of the landed interest, let railways be lined out solely for the national good. Let straight lines of them stretching from one end of the kingdom to the other, be formed and maintained at the public expense, for the quick transit of passengers, light valuable goods, the mails, literary property, and intelligence of every kind. Their importance in a commercial and social point of view would then be really national. Numerous collateral lines could be connected with them by private speculation. These would form the veins, and those the great arteries of conveyance. It would of course be impracticable for all or each of these arterial lines to be on the same level throughout their extent; and although it is true that the velocity lost in ascending one gradient, is nearly recovered by the increased velocity in the descent of another; yet as it is equally true, as experienced on the Liverpool and Manchester line, that the additional power required to draw up a train against a gradient, at even a moderate velocity, soon deranges the working of the engines (see *Gordon on Locomotion*), it would ultimately be more economical, the average general speed greater, and the moving power more equally applied, were all railways formed on levels. This could be accomplished by connecting any two level planes of railways by an inclined plane; and in order to surmount the inclined plane, a stationary steam-engine could be placed on the top of each, to pull up the trains with their locomotive engines, and down which the trains and engine could descend by their own gravity. Although this form of railway is by no means common, yet, after the errors which have been committed by railway engineers in the construction of many of the lines in present use, shall have been found to involve railway speculators in pecuniary difficulties, we are quite satisfied it will be found in the long run to be the form of railway the most expeditious, safe, economical, and philosophical.

Of all the eulogies ever uttered on any invention, that pronounced by Mr Godwin on railways, author of "*An appeal to the public on Railways*," surpasses them all. On contemplating the amazing advantages which must result from a perfect system of railways being established throughout the country, he thus breaks forth. "The anticipation alone of such a consummation fills us with delight; nor, indeed, can we contemplate unmoved the glorious prospect which will be opened to the world, if merely the vast and important works now in progress (works with which the useless Egyptian pyramids, or the justly vaunted monuments of old Rome's magnificence, will not be able to induce a comparison) be carried into execution. The length of our lives, so far as regards the power of acquiring information and disseminating knowledge, will be doubled; *and the whole world will speedily become as one great family—speaking one language, governed in unity and harmony by like laws, and adoring one God.*"

Upon this bit of enthusiasm, we have seen this witty appropriate criticism. "From this eloquent conclusion at which Mr Godwin has arrived, it appears that, by dint of iron-rails, stone-sleepers, hot water, and a little fire, all the Papists in the world are to become Protestants, all the heathens Christians. The Jews are immediately to join the Papists. The Turks are to deny Mahomet. The infidels are to become pious, and the Dissenters to unite themselves with the Church; together with all the millions of Indians; and not only *that,* but in order to enjoy the special advantages of steam-coach travelling, the confusion of Babel is to be all newly regulated, and every body in the world is to speak the same language. We candidly confess we never before had so high an opinion of the advantages of railroads, and sincerely congratulate the speculators in shares upon the acquisition of so zealous and able an advocate as the author of this pamphlet."

Earthing up of Potatoes.—We do not remember of seeing a single instance of potatoes unearthed up in the rows. The usual reasons for earthing them up, is the rapid egress of surface-water by the hollow drill, the ample quantity of earth for the tubers to grow in, and the upright support of the stems. It is considered to be conducive to the health of the potato plant, to support its stems from contact with the ground. Whether the practice had been originally established on rational principles, we have a doubt; but as it is so universal, it is worthy of investigation. The earthing up of turnips is somewhat analogous to it, and yet not quite analogous, for the bulbs of turnips grow mostly above ground. But on light gravelly land, resting on an open subsoil, turnips are frequently not earthed up at all, partly to save the trouble of performing what is considered by some farmers an unnecessary work, partly to retain the moisture in the land, but chiefly that the land may be in a level state for sheep when they are put on the land to feed at turnips. These reasons appear obviously well founded for omitting the earthing up the rows of turnips on dry soils, and also for earthing them up in soils susceptible of retaining moisture; but they do not explain so explicitly the universal practice of earthing up the rows of potatoes. The practice, therefore, is open to explanation. Our attention has been drawn to the subject by a correspondent, who has sent us an account of an experiment on the earthing of potatoes, performed by M. de Dombale, and the result of which leaves the matter open to farther experiment. In these days of potato failures, too many experiments, we conceive, cannot be performed to ascertain the true nature of the potato. The account of the experiment is taken from 1st vol. p. 206 of the *Journal des Connaissances usuelles et pratiques* for 1835. "M. de Dombale, a celebrated French agriculturist, says that he had uniformly believed and practised, and inculcated in his writings, the necessity and advantage of *earthing up the rows of potatoes*, after being horse-hoed. Several circumstances, however, having given rise to doubts in his mind on the subject, he was determined to bring it to the test of experiment. Eight rows of potatoes were horse-hoed; some little time thereafter they were earthed up, and when five inches high, they were again earthed up. Other eight rows in the same place, and under exactly the same circumstances, were *only horse-hoed* at the same time with the others, but received no earthing up, or subsequent culture. The rows that were earthed up *looked* more vigorous and thriving, but on taking up the crop, they weighed only 611 kilogrammes (about 1222 lb.), whereas the eight rows that were *not earthed up*, produced 704 kilogrammes (about 1408 lb.), and in a very fertile spot, the difference was one-third (this would raise the produce of the eight rows to upwards of 1600 lb.), in favour of those that had not been earthed up."

Theory of the Potato Failure.—By Mr A. Gorrie, Annat Cottage.—The "Studies in Agriculture," No. ii. vol. viii. p. 443 of this Journal, will be read with peculiar interest by the practical agriculturist. In these studies the intelligent student, their author, seems disposed to refer the recent failures in the potato crop, to "the deterioration of the soil." This reference I would not have called in question, nor shall I enter into the question, farther than is necessary to shew that J. R. has misunderstood my meaning in an article in this Journal, vii. 584, on that subject, and which it is here necessary to repeat, in order that the explanation which I am about to give may be understood.

"In the year 1806," says Mr Gorrie, "I received a few of the variety since known by the name of the Perthshire Reds, from the late Dr Coventry, who I was told had the tubers from Ireland. They were recommended as being tolerably mealy, very prolific, and not liable to curl. In 1807-8, I introduced them to the 'Braes' of the Carse of Gowrie, where they yielded an extraordinary return; and although on analyzing, they did not contain quite so much nutritive matter as the ordinary variety, yet from their vigorous healthy growth and prolific nature, they soon spread over the country, and the white flat disappeared. For ten years I cultivated the new variety in an early and dry soil, where potatoes are generally liable to curl, without perceiving the slightest tendency to that or any other disease, although I never changed tubers for planting. From the tenth to the fifteenth year of their culture here, they began to shew symptoms of curl, and the seed-plums which, on their first introduction, were exceedingly numerous, began to be very scanty. To communicate fresh vigour, it was found necessary to change seed tubers from late and high to low and early soils. This, for some time, say two seasons, generally prevented the appearance of curl, but *if continued longer*, the whole field was infected; nor, even in the first year of the change, was there anything like the usual crop of seed-plums observable. Ultimately a taint or rot in the seed-tuber appeared in this and other *long-cultivated* varieties, and every method of pampering their decayed constitution was and is resorted to. Heating in pits is recommended to be avoided; but in days of yore, heating in deep masses did not affect their health. Early planting has been recommended, and yet the occupiers of early soils must go to late situations for seed-tubers. Planting without allowing the seed-tubers to come in contact with unfermented dung, has been resorted to, but erewhile this was reckoned a wholesome practice. Planting when the soil is moderately moist is tried, but new and vigorous varieties succeed though planted when the soil is dry, whether newly cut or cut a month before planting, whether the dung be fresh or fermented, whether the tuber has been moderately or well ripened, or whether they may have been preserved in pits in the ordinary way or preserved with greater care."

In writing this, it never occurred to me that the practical reader would suppose when I stated, that "for ten years I cultivated the new variety in an early and dry soil, where potatoes are generally liable to curl, without perceiving the slightest tendency to that or any other disease," that I meant they were cultivated *on the same spot.* This conclusion, however, from my having written with some ambiguity of expression, appears to be the one J. R. has arrived at, otherwise he could not have pressed into the service of his theory, facts which, as far as they go, tend to establish degeneracy in the variety. When, in explanation, I inform J. R. that the rotation of crops was a five course, that potatoes occupied only one-third of the fallow division, that the fallow occurred only once in five years, and that turnips alternated with potatoes in the fallow division, he will perceive that at least nine, but more generally fourteen, years intervened between two crops of potatoes on the same spot, though cultivated on soil of *similar nature;* and the case being so, it is impossible to say the soil was "*over-cropped*" *or deteriorated by too frequent planting of potatoes.* I admit that "a favourite theory has a powerful tendency to influence reason, and to warp facts to its own purposes;" and were it not that I have seemingly been inexplicit in my expressions, I would feel justified in believing that J. R. has exhibited symptoms of the frailty which he describes.

The quotation from Mr Reid's paper at page 458, in which the following sentence is given in italics and capitals, "*every succeeding season* THE POTATOES ARE GROWN ON THE SAME LAND, THEY SHEW THE MORE OF THE DISEASE," shews, that J. R. supposed Mr Reid also to have planted potatoes, not only on the same kind of land, but on "*the same spot of land*;" a conclusion which, I doubt not, his candour will induce him to relinquish, after having seen this explanation. If this explanation does not in reality apply to Mr Reid's practice, I can only say it is what I understood by it. At all events I am confident in respect to my own practice, and as the facts I have stated can be corroborated by many persons, I consider them, independently of hundreds of others which might be referred to, as confirming the doctrine of the degeneracy of the potato by old age, when renewed by cuttings, grafts, or division of tubers, and not by seed. Although many vegetable physiologists, for whose opinion I entertain the highest respect, maintain different opinions, yet my own observations, corroborated by the opinions of others, induce me to adhere to that doctrine, and in which I am supported by that intelligent observer Mr G. W. Johnson, with a quotation from whose paper on the "Canker," at page 474, I conclude these remarks.

> "Although young trees are liable to this disease, yet their old age is the period of existence most obnoxious to its attacks. It must be remembered, that that is not consequently a young tree which is lately grafted. If the tree from which the scion was taken is an old variety, it is only a multiplication of an aged individual. The scion may for a few years exhibit signs of increased vigour, owing to the extra stimulus of the more abundant supply of healthy sap supplied by the stock; but the vessels of the scion will, after the lapse of that period, gradually become as decrepid as the parent tree. The unanimous experience of naturalists agrees in testifying hat every organized creature has its limit of existence. In plants it varies from the scanty period of a few months, to the long expanse of as many centuries; but of all, the days are numbered; and though the gardener's, like the physician's, skill may retard the onward pace of Death, he will not be permanently delayed. In the last periods of life they shew every symptom that accompanies organization in its old age—not only a cessation of growth, but a decay of former developments, a languid circulation, and diseased organs."

Coffee.—We think the following observations will be found of material use to our farming readers, and valuable to all who study comfort and economy.

In this age of peculation and adulteration, when we can depend on the genuineness of scarcely one article of consumption, it behoves all who regard their health and enjoyment, to manufacture as many of their consumable aliments as possible beneath their own roofs. Tea is become an *essential* in every family, and is at present sufficiently reasonable in price, to come within the limits of every grade of society, short of actual pauperism. But what "villanous compounds" of home-grown leaves, nay, it may be, "weeds of foreign growth," go to the manufacture of that beverage, which, when made from genuine tea leaves, is the most refreshing, and perhaps, par excellence, the most salubrious of any that can be taken! It is lamentable to contemplate the state of demoralization to which trade and traders have attained in this *highly moral* country; it is cruel that the very health of the community is remorselessly sacrificed by almost every tradesman who caters for our daily food! Tea, then, being adulterated to actual nauseousness, it becomes requisite to find a substitute for it, that cannot be subjected to the trickery of man. Coffee is a healthful and exhilarating beverage, though not so refreshing and soothing as tea. We would not advise our readers to turn to the pages of their cyclopædias, or those of any other work, where the learned sport their ipse-dixits upon its medical properties, and dole out their tiresome dogmas, on "the insalubrity of coffee for persons of such a temperament," on "its drying nature," "its heating tendency," &c. "Try all things, and hold fast that which is good." Form the judgment, we would say, upon the rational, extensive, obvious proof, that the whole population of Turkey, Arabia, &c., and nearly the entire community of France, &c., imbibe it daily with advantage, and have done from time immemorial. It is soon enough to reject the use of a boon, given by the prodigal and beneficent hand of nature, when we have *fairly* tried its effects, individually, and under all circumstances.

We confess that we are perfect epicures in this very delightful beverage; and as we abominate the muddy, mawkish rubbish, which is too often administered, and take it for granted that others who may be similarly impressed with its nauseousness, would be gratified to be informed of the most economical method of obtaining the best coffee, we will proceed to instruct them in our simple plan. There are two kinds of the berry to which we would recommend our readers to restrict their choice, the Mocha, and the Plantation, or rather Berbice; there is a third, which is cheap, but very coarse flavoured—the Ceylon—but we repeat, that the two first named are those to which we give the preference. To rigid economists we would advise, that Berbice only be purchased; but the flavour of the Mocha is so fine, that a portion should always be mixed with the former. It is quite essential that buyers should be intimately acquainted with the appearance of the various berries; because, although a grocer cannot adulterate the article in its raw state, he can deceive and pass off upon his uninitiated customers the worst, for the most approved kinds;—and this *we know to be the case* in many instances.

They who have once seen the two berries or beans, Mocha and Plantation, can never again be deceived; as we cannot shew we will describe them. We speak of coffee in the raw state, for on every account we would strenuously advise that our readers should purchase it unroasted. Mocha coffee is the smallest of all the usual sorts; it is round, plump, rough, equal sized, the colour inclining to buff, with a tinge of pale brown. The Jamaica, Plantation, Berbice (for they much resemble one another) are fine large flat handsome-looking berries, with a hue of grey-green, very different from those of Mocha, or even of Ceylon; which last, from similarity of colour, might deceive those who are not aware of this distinctive difference, namely, that they, the Ceylon berries, are of irregular sizes, ill shaped, and of a spotted, dirty cream-colour. The grey-green shade of the Western coffees is entirely deficient in those of Asia. In its raw state, this article of consumption, unlike other grains, such as rice, wheat, &c., appears to be entirely exempt from the destructive ravages of insects; it will keep good, nay, perhaps improve, for an indefinite length of time; and may consequently be purchased at any period, and in any quantity, when an opportunity may offer for obtaining it at a wholesale price.

Roasted coffee, on the contrary, deteriorates rapidly; and if exposed to the air, loses its aroma; hence one of the causes that this beverage is so seldom good. Instead of being exposed, as we see it in shops, it should be kept closely stopped in wide-mouthed glass bottles—such as "magnums," "Scotch pints," and "Winchester quarts." The sooner coffee is used after it is roasted, the finer will be its flavour; hence we prefer to roast only the quantity intended for the consumption of one week. The process is very simple, and occupies but twenty minutes. It is far more easily accomplished than other domestic occupations, such as breadmaking, churning, &c.; and when the plan shall have been tried for two or three consecutive weeks, so as to form a habit, that which our housewifely readers may be induced at first to start from as a trouble and innovation, will fall in with the regular hebdomadal routine of requisite housekeeping avocations and duties. Few persons are aware of the value of habit, nor how quickly a sense of duty will conduce to form *that*, which, *when formed*, renders the severe attention to the business of life a pleasure instead of a toil. We should not have said so much on so trifling a matter as roasting coffee, but that we know how difficult it is sometimes found to persuade a managing matron to swerve from her clock-work duties, to admit of another that would prove of equal, if not superior, utility to those already rigidly practised; besides, we are aware that a prejudice exists against roasting coffee at home, in consequence of the disappointment which attends the process when ill performed. "What man has done, man can do:" so woman has roasted mutton, and may roast coffee by attending to the plain and explicit rules by which we have enjoyed for years our own daily refreshment, in undeviating excellence.

We have heard that persons have actually cooked our Arabian dainty in a frying-pan, and smothered it in butter to keep it from burning! "Oh the pity of it!" Who can be surprised that the results of such an ungainly, antediluvian method should be otherwise than delightful? In private families, when this beverage is taken once a-day, a coffee-roaster should be provided, which will *contain* a pound of the raw berries, although only two-thirds of that quantity should be put into it; as, in the operation of roasting, they will swell to nearly one-third more than the space they occupy when raw, and room must be given them to move about and be well shaken during the process. These domestic utensils, although not common, are to be purchased at any furnishing ironmonger's. They are of iron, cylindrical shaped, and of various sizes; those which will contain a pound of raw coffee, are about four inches wide, and seven in length, with a small sliding-door, also of iron, having a ledge by which it can be opened and shut, by means of a pair of pincers, or even by tapping it with any convenient article, such as a pocket-knife. In the middle of this cylinder, at one end, is fixed an iron handle, about eight inches long, and hollow, into which a round wooden handle is fastened, two feet in length. Having made a clear fire *below the upper bar of the grate*, so as to admit of the action of rolling the roaster backwards and forwards along the top without impediment, put into the machine as much raw coffee as will rather more than three parts fill it, and commence roasting, by turning the handle quickly and incessantly, though not velociously. If this rotatory motion be stopped, a snapping noise will be heard; this is caused by the berries being unequally roasted: those at the bottom will be burning, while others are not exposed to any heat. The rolling backwards and forwards, therefore, must not be discontinued, except while another motion is substituted, which is, to lift the roaster up now and then, and shake it the contrary way, in order more thoroughly to intermix and change the position of the berries, so that the process may proceed equally. The great secret to obtain fine flavoured coffee, is to prevent the escape of the aroma, hence the roaster should be opened as seldom as possible; and for a quarter of an hour it will be wholly unnecessary. As the process draws to a close, however, it will be requisite to investigate its progress; but this must be done quickly. No kind of manual dexterity is acquired at once: but practice will soon render this as easy and certain as any other. On no account must any butter or other extraneous matter be introduced; coffee exudes an essential oil, which will prove the best, as it must be the only oily medium in the process. In a quarter of an hour the little door should be opened, and the state of the berries inspected. If they look brown, but of various shades, the heat has not been equally disseminated; and the roaster must be well shaken for half a minute, and then replaced on a cooler part of the fire, on the top bar, to finish gradually, still being rolled and shaken alternately. As twenty minutes is the time in which a batch will be finished with proper management, it must be looked at once or twice more, when the eye, as well as sense of smell, will soon acquire experience in deciding whether the operation is finished. It must now be taken off the fire; but as there is naturally a great body of heat still remaining in the cylinder (sufficient indeed to burn the berries), it must not be left; but should be shaken for two or three minutes away from the fire, in order that, while it cools gradually, *all that fine aroma, on which depends the spirit, flavour, and excellence of coffee, may be imbibed,* instead of being lost by opening and emptying the roaster while any heat remains. As soon as it is cold, it must be poured into a glass bottle, as before mentioned, and kept close stopped for use. Coffee wastes in roasting about two ounces in the pound.

When it is wanted for a meal, let only the quantity be ground that is required, put it at once into an old-fashioned coffee-pot, with two or three shreds of isinglass, fill the pot to within four inches of the top, with hot water, shut down the lid, set it on the fire, watch it, and as soon as it boils, clear it and put it on the stock or hob to settle and keep warm; but by no means on so hot a situation as to raise the grounds, or it can never be cleared again. Our readers will see how strenuously we insist on the essential circumstance of preserving coffee from exposure to the air. On the knowledge or ignorance of a trifling *knack* in almost every practical domestic operation, depends our success or failure; and as it is assuredly better worth while to perform a duty well rather than ill, especially with no additional trouble, minuteness of directions is most desirable. With the utmost care, so much of that exquisite aroma escapes, that no one can grind and make a pot of coffee without its being diffused all over a house; now this *scent* would become *flavour* if it could be confined.

We have named an old-fashioned coffee-pot, because we *have* "tried all things" of this kind, and have returned to our earliest friend. Percolators, French and English, biggins, —bags leno and muslin—new-fangled pots without a name,—cold water and hot, slow heating and quick, simmering and boiling, and simple infusion,—every plan, in short, that has ever been written about or thought of, has been fairly tried; —and the above is by far the most perfect method. Half an ounce for each person is perhaps a fair average quantity; but this must be left to choice. We have heard that coffee made very strong, and bottled, will be found exceedingly fine in a year or two. There are doubtless situations on the globe where a *corps de reserve* of this description might be very useful; but with our daily facilities of making it, with so little trouble, the bottling system appears valueless.

We have spoken hitherto of coffee as a morning and evening meal; but there is a purpose to which we have known it applied for a year or two past (and is still maintained) to which we are desirous to call the attention of our readers: this is, as a substitute for wine during and after dinner. There are many persons to whom the idea has probably never occurred, that they could enjoy a luxury, at once so cheap, refreshing, and delicious. If any would abstain from beer, wine, and spirits for "conscience's sake," what can he resort to so innocent and cheering as coffee? If any feel the pressure of the times, and is warned that his failing circumstances will not admit of the indulgence he has hitherto enjoyed, where will he find a succedaneum so little costly? If the sedentary man, with weakened powers of digestion, is necessitated to abjure pernicious stimulants, and comes to his midday meal cheerless and exhausted with mental labour, or chilled with inactive employment, what will so effectually restore circulation, and impart a genial warmth to the system, as a few cups of warm and invigorating coffee? If a thrifty farmer have been thrashing in his barn, and come in to his homely dinner hot and thirsty, what so likely to cool him and allay that thirst as a pot of this invaluable beverage? We have *known* such satisfactory results attend its daily use, that we fearlessly recommend it; and should rejoice to be assured that it would speedily find its way to every hearth in the British Empire.

We suppose that our readers are aware, it is taken without either milk or sugar in Turkey, Arabia, &c., and we can assure them if they would try the experiment for only one week, to take it pure, they would never recur to those adjuncts, milk and sugar, however devoted they might have been previously to these additions. In fact, such exquisite coffee as the above directions will ensure to every reader, would be spoiled by any admixture; it is only the abominable, spiritless, muddy, flavourless rubbish, that too often is manufactured by her Majesty's lieges, which requires to be rendered palatable by any admixture. We speak only of the dinner-meal; at breakfast and tea we offer no advice, merely noticing that, in our private opinion, sugar spoils both coffee and tea.

Artificial Dressing and Feeding of Tups for Sale.—As tups are few in number and docile in their habits, they are the description of stock upon which most artifice has been employed in preparing them for sale. The generative agency of one tup in full vigour extends over a hundred ewes; therefore, having one unobjectionable in his constitution and figure, is considered as equivalent to having an hundred ewes of a faultless shape; and hence the possession of a blameless tup of a pure blood has always been considered a valuable attainment. The kinds with which the Cheviot race are most subject to contamination are the old forest and Leicester breeds. A connexion with either improves the Cheviot shape, but directly withdraws that unctuous quality from the wool for which the last-named breed are so eminent; nor is it possible at all times to prevent a clandestine connexion, as all those varieties are frequently grazing in adjacent fields; but the principal evil consists in preparing a male lamb of a *mixed* breed to match with the genuine Cheviot breed. This is the more easily done, more apt to be done, and the buyer is more willing to be deceived, because the broad and full chest of a broken breed by either of the two varieties improves the Cheviot shape, which is generally too small in the fore-quarters. To assimilate the broken breed, however, as near as possible to the Cheviot figure, an extraordinary feeding is absolutely necessary. An impure breed, it is true, has always an air of discordance in its external appearance, an unpleasantness in the traits of its countenance; but this incongruity of parts is not sufficiently marked in every case, so as to form an unerring criterion by which to determine the purity of the breed; yet it should lead to doubts, and a closer examination of the animal. But extra feeding, even in a pure breed, hides most imperfections, and clothes with uniformity of proportion every unnatural touch in a mixed progeny; for how can imperfections be seen, or slight shades of different breeds be noticed, when defects are concealed, and the traces of a foreign connexion hidden with masses of fat? Superior breeding hastens forward a large and weighty fleece, and this lays the ground-work for farther deceptions. Having abundance of wool to work among, by shortening its growth in some parts, and encouraging its extension in others, the wearer may be made to assume the shape and air of any variety. No man of taste and discernment will admit of a broken breed to be propagated among his flocks; the external dissimilarity, though of itself a sufficient cause for rejecting it, is not the principal, because the disproportion of the chief organs which contribute especially to health and vigour, impairing their agency in distributing their peculiar secretions, renders them altogether ineligible stocking to breed from,—at least in all pastures where any severity in winter is expected. In such situations, and under such circumstances, the unfitness of a mixed progeny soon appears; and the mischief resulting from the adoption of a mongrel into a pure stock, either by mistake or design, cannot at once be appreciated, the wool, the countenance, the outlines of the general figure, only gradually evincing the evident marks of a spurious connexion, and indicating carelessness or ignorance in the manager. The variety thus tends towards an unsaleable and valueless kind of sheep. I could willingly be more plain and distinct in this matter, and state actual cases in a more explicit form; but hope the practice which I condemn will be discontinued, when it is seen it has been exposed.

The Ægrostis Segetum.* By Mr Towers.—The *green crops* of the farm may be justly deemed the ground-work, the soul, of the convertible system; this is a practical truth, the philosophy of which may be traced to, while it exemplifies the *theory* of, the *radical exudation* of plants. Now, if we can extend the rotation, and at the same time obviate inconveniences, and remove existing evils, we improve the condition of the farmer, and so far also that of the community at large. This remark has been suggested by the perusal of Mr Duncan's instructive papers on insects, connected with the devastations committed during the summers of 1836 and 1837 in England (if not Ireland, perhaps in Scotland also), by a subterranean caterpillar, that has ignorantly been termed the *brown grub.* It is to be hoped that Mr Duncan, in the course of his review of the entomological classes, will treat fully of this caterpillar, its parentage and habits: the subject is in able hands: what follows will not trespass on his province, but merely tend to solicit his attention, while it reveals a number of incontrovertible truths.

The complaints of failure in the turnip crops, from a variety of causes, remote from the ordinary attacks of the flea-beetle (*Haltica*), had been prevalent in Berkshire and other agricultural counties during the summer of 1836; it then appeared that the larva of a species of saw-fly (*Athalia centifolia*), vulgarly called " nigger," or the blacks, preyed upon the leaves. A chemist in my neighbourhood was willing to try the efficacy of a solution of sublimate; the application destroyed the plants, and, as far as it was tried, completed the work which the insects had commenced. Some of the true grubs appeared in different places, and utterly exterminated large breadths of fine bulbed plants; yet no step whatever was taken to detect the character of the insect, nor to counteract its mischievous assaults. In 1837 it was hoped that these would not recur; however, about August, the fields became patched, the bulbs loosened, and, upon examination, shewed the tremendous power of the invaders. I found the same ignorance to prevail every where. The farmers ascribed the mischief to blight, to the earwigs, to anything! but could give no intelligible description of the subterranean foe; for such it then was found to be, as, upon turning up a drooping plant, ten or even twenty grubs were brought to light. In September, a correspondent in Buckinghamshire sent me a letter with two specimens: these brought the point to issue. The grubs were familiarly known to me; I had seen such in every garden that had come under my observation, in the east, south, and centre of the kingdom. I discovered them to be a greyish caterpillar, the grey tint interspersed with black spots; the skin was smooth, firm, and tough. The figure was that of a perfect caterpillar; the size varying from an inch to nearly an inch and a half in length; the breadth greater in proportion; the head was dark coloured, almost black; there were three pairs of short, sharp claws in the fore part (the *thoracic pairs*), and four pairs of strong, short, flat-pointed, abdominal legs. The chief distinctive character was found in the tough, unyielding texture of the body: it might have been formed of Indian rubber, such was the firmness and intense elastic power with which it was endowed.

---

* Should this not be Agaristus?—Editor.

Until the late summer, I had never known this grub to attack any vegetables but those of the *brassica* family,—cabbages, savoys, brocooli. It was usual to see a plant here and there in the rows looking flaccid, perhaps fallen over; and when this was the case, upon turning up the soil, a grub was seen stealing a slow march toward the next contiguous plant. The wound inflicted was generally perceived at about an inch below the surface, and consisted of a deep hole, which passed through the parenchyma or cellular tissue, and deprived the leaves of their sap. But, recently, the ground has become replete with the vermin, which assails turnips, lettuces, and spinage. In quoting a passage from the letter of my correspondent, I shall place before the general reader the real state of the evil, as it existed in August, September, and part of October, in the middle of England, in Essex, and, I hear, to some extent also in Ireland. Whether Scotland and our northern counties have escaped, or have been partakers with our calamity, I have not been able to ascertain.* It is observed, after alluding to the grubs sent to me—"The same variety is a p pearing in our turnip-fields to such an alarming degree, that, unless something be done to prevent their progress, they will in a short time do a great deal of damage. We first detect them along *the sides of the ridges*, when they appear rather in an inactive state, and smaller than those sent you; but as soon as the turnip-bulbs have become an inch in diameter, they then pour in herds to the tender roots, which they feed upon most voraciously: we have, in several instances, taken from twelve to eighteen of these unwelcome visitors from one turnip, and they are found to be more or less affecting the whole crop. They appear to have a general aversion to light, as they attack the turnips immediately under the surface of the earth; and when turned up, they make immediate efforts to bury themselves again. It would appear that they are possessed of some poisonous quality; for, as soon as they puncture the turnips, their vigour is checked, and the leaves become flaccid." "We have gathered from our turnip-field within the last two days *two bushel* measures full of these grubs."

---

* We understand that the insect here alluded to is not so common in Scotland as in England.—EDITOR.

Being thus put in possession of living specimens, I first made use of them to determine their identity with the grubs of Berkshire: this leading fact was established beyond a doubt. Subsequently, from a short notice given in the October number of the *British Farmers' Magazine*, I was led to institute inquiries, which, with a comparison of other specimens, brought irrefragable proof that Essex and other eastern counties were ravaged by the same grub. In the mean time, it became objects of primary importance to determine the species, and to discover, if possible, a means to destroy the existing nuisance, and to prevent its recurrence.

At first, it was thought that the grub was the rook-worm, *i. e.* the larva of the May bug or cockchafer (the *Scarabæus, Melolontha vulgaris*); for the rooks were noticed, and found to search for and feed upon the caterpillars in all the infected turnip-fields. In fact, the larva of the chafer, which inhabits the ground during three years, is one of the greatest nuisances of the farm; and, from recent accounts, it appears, that "the ravages of this terrible insect are enormous in France, particularly in the rose nurseries in the country. Strawberries also attract the grub, and soon fade when touched by it. At the palace of Versailles, in the kitchen gardens, which are very extensive, scarcely a strawberry can be grown, all the plants being destroyed by the grub of the cockchafer! Dahlias and lettuces are preyed on with avidity; as soon as a lettuce is touched the plant fades."

These are a few of the particulars communicated in a very valuable letter from Paris, which has appeared in the Gardeners' Gazette of January 6. 1838, No. 53. Rennie, and the writer in Baxter's Magazine, mention the destructive voracity of the cockchafer. But vicious and rapacious as that larva certainly is, its efforts are chiefly directed against the roots of grass, which it totally destroys; and, in the present instance, it must stand acquitted on the charge which has been prematurely brought against it. Grass turfs are its peculiar abode; and in quitting this subject it may be proper to say, that it differs from the turnip-grub in being much larger, whiter in colour generally, having a red head, and six thoracic legs, of a pale brown colour, about the sixth of an inch long, distinctly jointed, and more or less clothed with hairs.

I can now positively assert, that the grub of the cabbage family is the *larva* or true *caterpillar* of a *moth* which lays eggs in June or July. These hatch, produce little caterpillars, which grow rapidly, and commence their ravages when the turnips have bulbed, and ought to be in a state of their most rapid growth. These facts tally with the remarks made by my correspondent; and it remains to be added, that the full grown insect generally ceases to feed in October, remains inert, though not torpid, in the soil, till it changes to its second or chrysalis state in April, or early spring. Its third transmutation, when it emerges in the perfect or fly state, takes place in summer. From direct information given to me by a gentleman who had proved the identity of the grubs I sent to him, by previously inspecting the moth produced from preserved specimens, I feel authorized to state, that the parent moth is the *Ægrostis segetum*, so named doubtless from its being the presumed agent of malady or disease to the corn crops.

To make "assurance sure," and to ascertain the periods of mutation, I have retained many of the grubs in moistened earth with fragments of broccoli-stalks; they are enclosed in a stone-jar, the mouth covered with paper, perforated to admit air, and kept in a cellar wherein the temperature is always mild. After repeated observations, it has become manifest that the first grubs consumed very little food to January since October; but that six others, lately obtained from a turnip field, have devoured the broccoli. In some instances their colour has become somewhat lighter, and at times there has been perceived an abatement of that extreme elastic power by which they curve their bodies, with a force that it is difficult to overcome. In order to prove whether the insects eat now at this season of severe frost (16°), pieces of Swedish turnip have this day (January 10.) been liberally supplied. In September, when their voracity was at its height, I tried what effect could be produced by a variety of chemical agents :—*immersed for hours* in air-slaked lime, lime and sulphur, lime and soot, and in earth abounding with these substances; in common salt, also in earth moistened with that salt, and with liquid sulphuret of potassa, sulphuret of lime, with or without soot, they remained, in most instances, sound and uninjured: once, when a good deal of ammoniacal gas was liberated, they lost elastic power for a time, but not permanently. One grub was plunged in a weak solution of corrosive sublimate, till it raised its head for air.* I then took the creature from its bath, and he immediately moved about with more than ordinary rapidity, as if in search of his native earth, to which therefore he was consigned. To close this negative evidence, I am constrained to observe, that unless nature find a remedy, none that the farmer can apply will clear the land of this pest to a growing crop.

Kohl Rabi. By Mr Towers.—The able Buckinghamshire correspondent, whose first letter furnished the information contained in the quotation above given regarding the insect, early in November last sent me a letter, and a *specimen of a plant* which promises in every respect to rival the turnip, and to offer advantages of which the farmer ought at once to avail himself. The following particulars will communicate every essential connected with its culture.

The plant was a beautiful well grown specimen of the turnip-rooted cabbage called *Kohl Rabi*; it weighed nine pounds.

---

* It must have raised its head for some other purpose, for insects never breathe by the mouth or head.—EDITOR.

I planted it forthwith to secure seed from a subject so perfectly formed. This variety of one of the many species of Brassica, termed by Professor De Candolle, *Caulo rapæ*, is not strange to England; there are two sub-varieties, the white and purple-bulbed, both of which I have grown successfully myself; the former is even cultivated as a delicacy in the East Indies. In the gardens of Madras it grows with extreme rapidity, in consequence of the high degree of moist temperature; and the pulp of the bulb is proportionably rich and delicate ; with us it becomes coarse and hard. The plant sent to me was of the purple variety; the grower remarked, that under able management it would be found one of the most valuable of roots for farm culture. He regretted that it was not more cultivated, as it possesses several advantages over Swedish turnips, and the more common varieties of white turnips; because, *first*, It will grow and flourish upon soils not calculated for the growth of turnips, that is, upon rough land quite unfit to receive the small seeds of that vegetable; *second*, Its produce is equal in weight to that of the Swede; *third*, It is not so liable to the attacks of the grub as the pulpy substance of its bulb, raised as it is by the hard fibrous pedestal-like stem—holds no communication with the soil; it is thus completely placed beyond the reach of the grub, which has an aversion to the light, and is seldom, if ever, found committing depredation above the surface. Upon a plot of ground occupied with a young succession of drumhead cabbage, adjoining another planted with purple *Kohl Rabi*, the grubs had been found, a cause of great annoyance; whereas they had not been observed in one single instance to touch a plant of the *Kohl*.

This prolific and extremely *hardy* vegetable transplants very well, and the directions given by my correspondent for its culture are founded upon this valuable property. The seed ought to be sown in the same way as that of the drumhead or ox cabbage, in a bed of the garden where it ought to remain under the eye of the gardener until it have arrived at a stage which places it beyond the injuries of the turnip-fly (*Haltica*), when it ought to be removed to its final destination, where it will not fail, under proper management, to return a produce, as was before said, equal in weight to the Swedish turnip.

My own experiments taught me that March, or the early part of April, suited the sowing; that two feet distances were favourable to the ample development of the bulb (or swollen stem) that cleanness, effected by one or two hoeings, and one digging, promoted the health and increased the bulk of the plant; thus the pulpy stem acquired the weight of five, six, or more pounds. If upon fair comparison the food or nutriment be found equivalent to that of the Swede in a like time, the hardy nature and other superior qualities of the Kohl ought to recommend it effectually to the wise agriculturist.

Lucerne and Saintfoin. By Mr Towers.—Lucerne is the plant of plants! yet its merits, though undeniable, are but imperfectly understood. It is a native of England, belongs to the seventeenth class, fourth order of Linnæus, (*Diadelphia decandria*) and to the natural order *Leguminosæ.* It is a member of the genus or family *Medicago*, medick, distinguished by having ten stamens, one of them distinct from the other nine. One seed-vessel, a *legume* or pod, spirally twisted or sickle-shaped. The figure of the blossom is that termed butterfly-shaped, (*papilionaceous.*) One plant (*M. sativa*) grows to the height of two feet or more; the stems are upright and firm, the foliage ternate, of a rich lively green, the leaflets saw-cut at their edges, the flowers are produced during June or July, in spikes, and are of a full violet blue. I extract the following from Loudon's Encyclopædia of Gardening, partly to prove the great antiquity of the culture, but particularly to shew the fallacy of the concluding observations, and thereby evince the worth of the plant.

"It is highly extolled by Roman writers; it is also of unknown antiquity in old Spain, Italy, and the south of France; is much grown in Persia and Peru, and mown in both countries all the year round. It is mentioned by Hartlib, Blythe, and other early writers, and was tried by Lisle, but it excited little attention till after the publication of Harte's essays in 1757."

"But though it has been so much extolled, it has yet found no great reception in this country. If any good reason can be given for this, it is that lucerne is a less hardy plant than red clover, requires three or four years before it comes to its full growth, and is for these and other reasons ill adapted to enter into general rotation."

I have grown lucerne during four or five years, and previously I had witnessed its great success and extensive culture in the Isle of Thanet, Kent; there it is a *sine qua non*, because it affects chalky districts, and sends down its wiry elongated roots deep into the interstices of the chalk. It succeeds perfectly in sound loams, and therein appears to me to require little manure. *Hardy it is*—and as to tardiness, though the plant may acquire strength, and improve during four years, the fact is beyond controversy, that if sown in drills about the third week of March, and the spaces between the rows (from nine to twelve inches) kept clean by the hoe for the first three or four months, the young plants, if favoured by a mild spring and genial showers, will advance with so much vigour and rapidity, that a first cutting over with the scythe can be made in June or July, and three other cuttings will follow in pretty regular succession, between the latter period and the first of November.

Seasons will of course vary; soils and other auxiliaries may be more or less favourable; but that which I have stated has occurred; it is the result of my own experience and practice. I have during five seasons witnessed the abundance of green food, which is produced by a plot of young plants, the supply being ample for a cow, even within four months after the sowing of the seed. I am thus authorized to refute, upon the evidence of facts, the charges contained in the concluding paragraph of the quotation. In cutting for a cow it will always be advisable to take the plant when it is tender and juicy, and such it will be when about a foot high. I have thus cut my plot over six times after the first year, but they who leave the plants to grow two feet high will find the stems rigid, fibrous, and less juicy; and that what they gain in bulk will be lost in time and quality.

As to the trouble in managing an established crop, it is really nothing. Though I allow it is good to hoe twice during the summer, as the plot is mown, piece by piece, yet *one general fork-digging* at that period of early spring, when the plants exhibit the first symptom of growth, so as to remove every weed and loosen the surface of the soil, will be amply sufficient to secure the safety and full development of the herb. Upon the whole, lucern is a plant of the utmost value; for if the seed be good, the ground rich and in heart, and rendered deep in the first instance by a thorough trenching, the young plants start into lively growth, attain strength in the shortest possible time, and yield a bulk of luxuriant herbage that cannot be surpassed. If the plant require four years to attain its maximum of power, it is still a giant even from its infancy, advancing from strength to strength.

Well might the writer of a recent agricultural report (of Norfolk if I mistake not) recently exclaim, "What a plant is lucern?" I re-echo this introductory "note of admiration," and will unhesitatingly assert, that if abundance, permanent and unfailing, particularly in shallow soils upon chalk-rock, be the object of the farmer, he will attain it by the cultivation of lucern. The rotation must be improved by it, as in point of produce it will yield double the bulk of grass from an old sedgy meadow.

The soil which is most favourable to the perfect growth of lucern is worthy of consideration. Chalk is what it affects, and therefore we find it most generally cultivated in Kent, and those parts of the southern coast wherein the subsoil is a chalk-rock. But my fine plot grows in a rich, deep, and rather sandy loam; the subsoil is indeed chalky or marly, but at a considerable depth. It was prepared by taking off the turf, trenching to the extent of three spits, and placing the turfs, their grassy surface downward, at the bottom of each trench. Upon these reversed turfs a sprinkling of common salt was given, and the earth was returned into the trench, with the precaution to keep the heavier and inferior soil below the fine black earth of the surface. Due preparation affords a rich and permanent pasture for the wandering roots; and my piece, of hardly one-third of an acre, has been so undeviatingly productive, with little subsequent manuring, that, in a showery season, we have found in cutting over the end where we began ready for the scythe again before the mowing was completed. Lucern is known to produce much milk, perhaps more than any other of the artificial grasses (*Leguminosæ*); but some complain that it communicates an austere or bitter flavour. I doubt the fact; but would always recommend that it be not given quite fresh to a cow, particularly at an early period after calving. If the required quantity be cut over night, it will be fit for the stall by ten o'clock of the following morning; and again, the afternoon meal should lie exposed to the sun for two or three hours before it is used.

A well prepared field, if kept clean by the forking, will remain productive for more than ten years; but as a change of crop always promotes abundance, it would be advisable to prepare a successional plot every six years.

The grass and weeds raised by the fork, and raked up with the small quantity of earth, adhering to the roots, if salted and sprinkled with quicklime and placed in a heap, will form a most excellent manure for the lucern. The cuttings *here* are usually over by the end of October; the herb then becomes, as it were, torpid, and whatever manure is applied should be given as a top-dressing during the winter's state of repose. The surface must not be disturbed at that season, nor till the herb begin to grow, then, as I have before said, the fork-digging will effect all that is absolutely indispensable; it will turn in the remaining manure, remove the encroaching weeds, and open the soil, burying a fresh surface into contact with the advancing rootlets. The experience of one or two seasons, under commonly favourable auspices, will verify all that I have asserted.

Somewhat resembling lucern in character and habits is the French grass or Saintfoin (*Hedysarum Onobrychis*), a lovely flowering plant, rich in herbage, and also a native of Britain. The grand object of agriculture ought to be the renewal of soils, and the adaptation of crops; and as science advances, and its sons become more influential, these objects will be attained.*

---

* The climate of Scotland is far from being genial to the growth of either lucern or saintfoin.—EDITOR.

Abuses of Bone-Manure.—The character of bone-dust as a trusty manure for turnips, runs the risk of being depreciated by the injudicious manner in which that manure is sometimes applied to the soil. It is found, in singling the turnip crop, that the bone-dust is liable to be brought up to the surface of the ground by the root-fibres of the ejected plants. From this circumstance, it is conceived, that a stratum of earth betwixt the bone-dust and the turnip-seed would prevent the recurrence of the evil; and accordingly, to effect this purpose, the bone-dust, in some instances, is either dropped into the drill by the hand, covered up by the plough, and the turnip-seed sown in the drill by the common turnip sowing-machine, as in the case of farm-yard manure; or the bone-dust is first sown by one machine, and then the turnip-seed by another, immediately or shortly afterwards. These plans are practised in the Borders of England and Scotland, a part of the country which is occupied by farmers, whose common sense, independently of their agricultural skill, might have warned them against their dangerous consequences. Such a practice could only have originated from giving no heed to the nature of bone-dust, and the growth of the turnip plant towards maturity.

It is clear, that if a stratum of earth intervenes betwixt the manure and the turnip-seed, a *quick* braird of the turnip plant cannot be insured. It was the slow brairding of that plant which formed the ground-work of the universal complaint against farm-yard manure, however well prepared, for raising turnips, on dry soil in a dry season, and especially on strong land in a dry season; and the great recommendation given with bone-dust, was that of its *insuring* the early braird of the turnip-plant in all seasons. The complaint now, under the practice above described and condemned, is, that bone-dust does not insure an early braird of turnip in strong land; but, so long as the practice of placing earth betwixt the manure and the seed is followed, a quick braird ought not to be expected. Contact with manure will cause turnip-seed to vegetate in a short time. Could the seed have been placed in contact with farm-yard manure as easily as with bone-dust, the latter would never have acquired the fame it has as a turnip manure. The firmness with which the roots of the turnip grasp the manure, shews the great capacity for manure which they possess in the early stage of their growth. It is this tenacity for manure of the root-fibres which raises so much of the bone-dust to the surface of the ground, by adhering to the roots of the ejected plants; and whenever turnip seed vegetates in contact with farm-yard manure, the same inconvenience results. In the case of dung being brought to the surface, it there becomes wasted, but in the case of bone-dust, the resurrection of the bones not in contact with the growing plants, is of no consequence, because, while exposed to the air, the bones lose none of their fertilizing properties; and none of them which are brought up escape being again covered by the subsequent operations of hoeing, scuffling, and earthing-up. Although the bone-dust should be scattered between the drills, if it is at all under the surface of the ground, the long and tender fibres from the turnip-plant, which extend a considerable distance around every plant, will eventually derive benefit from it. But even should any of the bone-dust be left exposed to the air, on the surface of the ground, after all the operations are completed, it is much better to suffer that loss, than run the risk of losing the whole crop by improperly checking the braird. Eventually the bone-dust cannot be lost, for whenever, by any means, by ploughing, by tramping of sheep, it is pushed into the soil, it immediately imparts its properties to the soil. The increasing scarcity of bones, and the consequent advance in price of bone-dust, from 2s. 6d. to at least 3s. if not 3s. 6d. per bushel, and which difference of price, small as it may appear, constitutes a considerable additional expense in the turnip-crop on a large farm, has no doubt suggested the adoption of this pernicious practice; but although economy in the use of bone-dust is a audable endeavour, it should never be attempted at the risk of the well-being of the crop. Bone-dust may be economically used by mixing it with ashes, whether derived from the combustion of coals or peat; or where farm-yard manure is abundant on any farm, let some of it be spread in the drills in the usual form, and the seed afterwards sown along with bone-dust on the tops of the drills. In this case, the manure need not be much prepared, as it will have time to ferment in the ground before becoming useful to the turnip-crop, while one-half of the usual quantity of the bone-dust, namely, one quarter per imperial acre, will suffice for the brairding of the plant and its nurture, until it finally depends for support upon the manure.

On considering the effects of bone-dust on land, it is not improbable that the experience of years may prove the abatement of its efficacy as a manure, after repetition of its application on the same ground. This appears to be the opinion of the Duke of Portland, as expressed in a communication by the Duke himself, in Bell's Weekly Messenger of 23d April 1838. As we know that his Grace is an accurate observer of the operations of the field, his statement is worthy of an attentive perusal.

"In 1834, two fields of sand-land adjacent to Clumber Park," says his Grace, "the one at right angles to the other, each containing about twenty acres, were sown with seeds among barley. Whenever these fields had been sown with turnips for twenty years before 1825, they had always been manured with bones. In that year they were largely so manured. The seeds sown with barley in 1826 having been burnt up in that dry summer, in 1828 the land in both these fields was again broken up. In 1829 it was again fallowed with turnips and manured with bones. In 1833, both these fields were again sown with turnips, parts of each of which were manured with bones, and the remainder with farm-yard dung.

"In 1834, when the corn was out, it was found that the seeds had failed in each of these fields where the bones had been applied; and that they were very good where they had been manured with dung. In one of these fields the failure exactly followed the line of the difference of the manures, with two exceptions, that the seeds did not quite fail in two spots where formerly there had been dung heaps. In the other field the failure did not so exactly follow the line of demarcation, but the exceptions were very few. Generally speaking, the manured land is better than the boned land, but the difference of quality is not great, the crop of barley on the manured land had been at the rate of five quarters per acre, on the other four.

Immediately after harvest, fresh seeds were sown on the boned land. They came up very thick, but in six weeks died and disappeared. During the winter the land was again fallowed, and fresh seeds were again sown in the spring of 1835. They cannot be said to have failed, but they were a very inferior crop; and, notwithstanding a manuring of farm-yard dung applied as a top-dressing the following spring, they have not yet recovered a parity with the rest of the fields. In this case it seems impossible to attribute the failure of these seeds, where they have failed, to any other cause than the bones, which had certainly been applied with unusual abundance; and it is the more surprising that such a cause should have produced such an effect, because, in the early periods of the use of that manure, it appeared to be in no respect more advantageous than in its tendency to encourage the growth of the clovers. Of this tendency, the most remarkable instances have been repeatedly seen on very poor land, and none more so than one which occurred on a very poor piece of land prepared for a plantation by a crop of turnips, manured with forty bushels per acre, on which, between the trees, a great deal of clover has spontaneously sprung up. Previously to this land having been broke up for turnips, scarcely a plant of clover was to be seen. Now the fields on which the seeds have failed had (as above stated) received, much more frequently than usual, complete dressings of bones.

"Combining the great advantages of bones on the first application of them with this failure, it seems difficult to avoid the conclusion, that as the bones, while they are new to the land, have produced the most beneficial effects, and as this failure has taken place where their application has been most frequently repeated, the success is in a great measure owing to the novelty, and the failure to the repetition of their application.

"If the preceding statement required any confirmation, it has received it in 1837. In this year, a field which had been turnips in 1836 had been laid down to grass. The north side of this field is very inferior sand-land; and as, till lately, it was supposed that such land would not pay for the expense of bones, they had never been applied to it. For the first time in 1836, bones were used for the turnip fallow. The south side of this field, which for many years has always been manured with bones when in fallow for turnips, was divided into four divisions; the western side was manured with farm-yard dung; that next to it with bones; the two eastern divisions were manured, the one with rape-dust, and the other with malt culms. After harvest, the seeds on the north side appeared to be best; then those on the western side of the field; then those on the two eastern divisions, which were rather inferior; and those on that where the bones had been applied were visibly the worst. The frost has been so injurious to the seeds, that this difference between the three eastern divisions is not now so marked as it was before the frost; but the superiority of the northern side and the western division is very apparent.

"This field lies nearly opposite to Scotland Farm, on the other side of the road leading from Ollerton to Worksop, and three miles from the latter."

In this statement the soil is described as "*sand*-land:" the rotation followed on it a four-shift, viz. turnip-fallow, barley, grass, and a white crop; and the quantity of bone-dust applied forty bushels per acre. The remarks we would venture to make on this statement are, that a rotation of four is not adapted to any "sand-land" with even an unlimited command of manure; for that course keeps light land too much under the plough, makes it too pulverulent, and thereby endangers its texture with deafness. Such land should always be *pastured* at least two years, and better still for three, in order that it may be consolidated into a firm condition by time and rain, and the tread of animals. It is not stated whether the turnips were wholly carried off the ground, or partly eaten on the ground by sheep. We have, universally in Scotland, a notion that the half, at least, of the turnips raised by means of bone-dust ought to be eaten off by sheep; for, without such assistance from other manure, we conceive the bone-dust would have too much to do of itself in supporting all the crops during the rotation. This being the notion in Scotland, the practice originating from it is, that never more than sixteen bushels generally, though some farmers apply twenty bushels, is applied to the imperial acre. We have also a notion in Scotland that bone-dust has a caustic quality, and that considerably more than sixteen bushels to the acre on light soils, would do more harm than good. We have ourselves experimentally tried the effects of different quantities of bone-dust in raising turnips on light gravelly soil from twelve to twenty-five bushels per imperial acre, and found the crop improve decidedly to sixteen bushels, but not in the least beyond that quantity. So far, therefore, as the turnip crop was concerned, any quantity above the sixteen bushels was thrown away. The circumstance, as expressed in the statement, that farm-yard manure yielded more barley on the "sand-land" than bone-manure, after the land had been previously boned, shews analogically the fertilizing effects of feeding sheep at turnips on land that had been manured with bones. Until therefore we learn that turnips had been raised on the "sand-land" with only sixteen bushels per acre; that, at least, the half of them had been eaten off the ground by sheep; and that the grass after the barley had been pastured at least two years, we are more disposed to ascribe the failure of the grasses to the system of farming described by the Duke, as being quite inapplicable to such soil, than to injurious effects from the bone-dust.

Extended Use of Machines for Sowing Grain.—The extended use of sowing-machines, both drill and broadcast, will most probably supersede in a short time the practice of sowing grain by the hand. We own we should not like the idea of abandoning this ancient practice, though for nothing else than for the many pleasant associations by which it is endeared to every lover of field labour. These associations can never be recalled whilst using any sort of machine. Hand-sowing is also an accomplishment, and confers a superiority on the possessor. The season of the year on which it is most usually practised, inspiring the mind with the lively hope of a manifold produce; the measured step marking the time, and reminding of the progress of the work; the simultaneous action of the limbs, inducing the regular exercise of the muscular frame; the steady eye directing the flight of corn with a rainbow-like sweep to its destined place in the earth: all these tend to interest the sower in the continuance of the operation. Sowing by the hand, too, is a quick operation, one man keeping two pairs of horses, two men, and a woman in constant occupation. In this respect it is doubtful that machine is cheaper than hand sowing. It is, however, a difficult art, and can only be exactly performed after much practice; and as a proof of the difficulty of its acquirement, there are many men who never become neat, expert, and safe sowers all their lives. Being thus a difficult operation to acquire, and at all times performed with much labour, machine labour will no doubt supersede it on all large farms, and, indeed, on all farms on which the grass-seed sowing-machine is used. The precision and beauty with which the broadcast sowing-machine distributes the grass-seeds on the ground, in all states of dry weather, in comparison with the hand, and the easy adaptation of that machine to the sowing of corn, has already substituted it for the hand on many farms. The quantity of seed to be sown can be regulated with much greater precision by any machine than by the hand. Besides, the broadcast-machine, the drill-machine, we perceive, is now much in use on the Borders, particularly in sowing wheat. There are various sizes of those drills, but all are formed for the same purpose, and on the same principles. Their object is to deposite the seed at a given depth in the soil, and cover t up so as to require little harrowing afterwards. There is practice of drill-sowing in Cumberland and Dumfriesshire, hich deserves imitation in other districts. A person brings large Suffolk drill from Suffolk, and undertakes to sow the utumnal wheat with it, at 2s. per acre. This is a very effi- ent implement, and as it costs L. 40 when new, employing it in this manner seems a very good plan of getting the wheat seed sown. The annual interest and tear and wear attending the ownership of this drill, would be equivalent to the sowing of twenty-four acres of wheat land. It is generally believed that drill-sowing saves seed. Whether the saving is an object, appears doubtful from the following statements of Lord Western, in a letter to Lord Rayleigh, dated from Felix Hall in last March. He addresses his lordship to inform him "of the result of a mode of wheat sowing which differs from the practice of this neighbourhood, and which I have tried eight or ten years with great success, and the advantages of which are peculiarly striking this year, when the failures of plants are so prevalent. Any person now may have ocular proof of it. I can shew them 100 acres of wheat, upon every acre of which I have a sufficient plant—I may say a full and thriving plant upon 90 of the 100. It is a nice question at all times to determine cause and effect, but I have no doubt in this case that the superiority of my wheat plant to most of my neighbours this year (which will generally be admitted by them) is owing entirely to my mode of putting the wheat into the ground. I use the drill in rows, nine inches apart, and put in at least three bushels per acre. I adopted the plan in consequence of what I saw at Holkham about eight or nine years ago, and from the strenuous advice of my friend the Earl of Leicester, and the example of himself and several of his very intelligent and experienced farmers, who joined him in urging me to this course. One old farmer, who occupied a very large farm under him, told me he had uniformly pursued that system above fifty years with the greatest success; he was of opinion that the quantity of seed was generally too small (of course the quantity should vary according to circumstances), but he was satisfied an increase of seed would increase the growth of the country most essentially. Since that time I have sown all my wheat in this manner, and I have had great crops, I may say quite equal to the best farmers around me. I by no means ascribe these large crops of wheat exclusively to this drill system, because the seasons have been so good, and I have farmed high. I confidently believe, however, that something is due to the system, and that this year has shewn that great advantages are derivable from it in seasons, and under circumstances that are unfavourable for the preservation of a good plant—the first object of every practical farmer, particularly on heavy land, whereon are so many failures. The general objection to the plan is, that the wheat will be too thick in the rows, that it will grow up without tillowing, and with many short ears. I do not, on experience, find this objection well founded. I think the number of short ears to be found in this mode is not greater than in the wheat that has more room to tillow, and they are generally filled with good corn, full-sized grains. I hardly have heard any other objection made, and the advantages of the thick plant are many, some rather peculiar to this county. One considerable difficulty we have to encounter in our clay-bottom lands arises from the tardiness of our early vegetation, which renders our early plants comparatively a more easy prey to vermin of every sort, such as the slug, the worm, &c. and bad ungenial weather. Where there are any rabbits, destruction will often ensue in these lands from the weakness of growth in the plant, which would be overcome in warmer and quicker vegetating grounds. This remark of course does not apply to gravel-bottom lands, which are to be found in some few and limited districts. Now, it will be admitted generally, that where the plant is thick, it will grow considerably quicker upon first coming out of the ground—the numerous blades seem to protect and keep each other warm; and the roots, partly matted together, get a better hold of the ground, so that they are not loosened by the biting off the blade, nor are they so loosened by succession of frost and thaw; they are by no means so likely to be root-fallen, which is productive always of the worst consequences when it occurs, and the mischiefs of which are peculiarly striking in many instances this year. I can drill with the heavy Suffolk drill, covering ten feet or twelve furrows at a time, nearly if not quite as straight as is practised in the light lands of Norfolk and Suffolk."

We were glad to observe the prevalence of ribbing with the small plough the seed-furrow for spring wheat or barley on a winter ploughed furrow. There is no better mode of obtaining a fine mould, a good depth of bed for the seed, and of avoiding the bringing up of a raw clod which the ordinary plough would inevitably do in a late or damp season, and of dispensing with much harrowing. This ribbing is applicable to all soils, and particularly to those which are apt to throw out in severe frosts and bright sunshine in spring.

Strictures on Potato Culture. By Mr James Balden, forester to Lord Blantyre, Lennoxlove, East Lothian.—Having for some time past paid considerable attention to the raising of potatoes, not only with the view of obtaining the greatest quantity, but also of remedying the evil complained of for some years past in the failure of the seed, I am strongly impressed with the opinion that the method I have adopted has proved abundantly successful in both these respects.

It must be obvious to every one at all conversant with raising potatoes, either in the fields or in the garden, that one of the radical defects of cultivation, and which operates most powerfully against the fulfilment of the crop, is the want of due preparation of the ground before planting. The ground always receives the same treatment before planting, without the least regard being paid to the state of weather in the preceding winter, whether it has been mild or severe. The land is too little worked for potatoes. I would recommend the dung being put into the land intended for potatoes in the autumn, the ground to be well worked, laid up in drills at the distance intended for the crop, and to remain in that state all winter. The seed may then be planted in spring, in the drills made before winter, when a fine clean mould is thus prepared to cover the seed. Should a sufficiency of dung not be procured in autumn, a little more can be put into the winter drill before planting. By this plan, a fine mould, freed from vermin, is applied next to the seed set, and at the same time much work is saved in spring, when possibly there is less time to spare. But I would farther recommend the drills to be harrowed down, and the ground receive another furrow of the plough across the direction of the drill, and again properly cleaned before making up the drills for planting. The ground cannot be made too fine before planting. In fact, the same treatment should be given to ground intended for potatoes before planting as wheat and turnip ground receives before sowing. The usual practice, however, in East Lothian is to consider the preparation of the ground for potatoes as a secondary matter, for, if the farmers can secure only as many potatoes as serve themselves and their servants, they care for no more. The potatoes are generally planted on ground intended for fallow, which is never touched until the potatoes are just about to be planted, let the ground be never so foul, conceiving there will be plenty of time in summer to clean the ground; but such a cleansing is impossible to be properly performed without injuring the young fibres which support the tubers.

I have often seen potatoes planted on ground which was so coarse for want of work, that it almost ploughed what is called in "whole furrow," and of course the seed-sets were buried under, and the drills covered with, large clods, which lie in that state until it is thought to be time to have the clods broken or removed in order to allow the stems to come up. The clods are often removed by harrowing, which exposes the drills to be cracked by the sun's heat, and the seed-sets to be attacked by the crows, and the young stems are thereby much checked in their growth. The first operation thereafter is the hoeing around the stems for the purpose of cleaning the ground, and at the same time drawing away a little earth from them.

This hoeing cuts and destroys a great number of the young fibres, and gives a fatal blow to the growth of the young plant, especially if dry weather set in. I witnessed one field, in particular, treated in this way, in which about forty people had potatoes planted, and what with the destruction of the crows after harrowing, and the scorching heat of the sun, more than one-half of many of the drills were destroyed. I measured in many parts from five, ten, fifteen, to twenty yards left blank.

I say the whole of these operations, in the way they are done, are injurious to the growth and nature of the plant. Instead of having the ground to clean after the crop is in it, and hoeing and drawing away the earth after the plant has appeared above the ground, the first thing should be to draw the earth up round the stem time after time to nourish it, until the drill has been raised a foot or fifteen inches high, according to the strength of the stems. The furrowing up is also a great preservation of the seed from the crows. Every time the earth is drawn up, the stems set out new fibres for the production of new tubers; whereas the common practice is to be content with only one furrowing up.

It is also my opinion, that, when the ground is foul, it is of advantage to plant the seed whole, at about three feet betwixt the drills, and from eighteen inches to two feet distance in the row, which distances may be regulated by the vigorous state of the ground. There is no loss of seed in this way of planting, as may be supposed; for should the seed be cut into an average of four parts, and each set planted six inches apart, the whole of the seed still covers two feet of ground, and there is the saving in the expense of cutting the seed, besides the extra planting, for one person will plant the whole seed in the way recommended as quickly as four persons with the cut sets. Should there be any insects in the ground, they are not so apt to seize upon the whole seed as upon the cut sets. I have been in the habit of examining the seed after it was planted, at stated intervals, and uniformly found that the whole seed remained almost free from vermin, whilst the cut ones were completely destroyed; and as the seed was infected or wasted by the insects, so were the stems weaker or curled. It is abundantly evident to me, that this is the main cause of the failure in the crop complained of. Attention should be paid to selecting the seed, and especial regard had in selecting that perfectly free from vermin, or that which has been raised in soil where no vermin or insects prevail.

Pursuing this plan in preparing the ground and selecting the seed, I planted, last year, twenty potatoes of the buff kind, part of the produce of a single stem which I planted the year before, at three feet betwixt the drill, and about two feet in the row; and the first two times I furrowed them up, I covered them all over, and afterwards I furrowed them up at different times, until the drills were raised to fourteen or fifteen inches in height from the bottom of the stem. By this means potatoes are produced in much greater abundance, and a strong argument in its favour is, that the largest are generally at the top. From the above twenty potatoes were produced the astonishing number of 762, measuring thirteen pecks. The produce of several of the stems weighed a stone each; one stem produced thirty potatoes, two of which weighed 5 lb. The thirteen pecks were raised on a piece of ground eighteen yards square, that is, at the rate of 260 bolls of 20 stones per acres. The Gardeners' Society in Haddington, at their meeting on the 26th December last, in consideration of this unprecedented increase, awarded me a premium.

My potato crop for some years past, on one piece of ground, has nearly or altogether failed until last year, when, by following the above method, an excellent crop of blues was produced, some of them measuring about fourteen inches round; and from each of two stems of a white kind, name not known, was produced about a peck of ordinary sized potatoes.*

---

* Mr Balden's plan for raising potatoes on good land, or on land in good heart, is excellent. On bad land, or land in bad condition, the sets require to be placed near the manure, to insure a crop at all. But his theory in regard to the agency of insects in causing failures of crop we suspect is far wrong. Insects no doubt will devour seed-potatoes, as food, whether whole or in sets, wherever they can fall in with them; and they will the more easily devour a cut set than a whole tuber, inasmuch as the pulp is more easily attained after the operation of the knife than through the skin. But all the damage insects can effect on sound potato-seed has never been proved to be great; for the discovery of insects on decayed or decaying sets is no argument in support of their great destructive propensities against the potato in particular, as it seems to be a law of their nature to devour

English Agricultural Society.—At the dinner, after the last Show of the Smithfield Club, Lord Spencer expressed a wish that an Agricultural Society should be formed in England, for the encouragement of practical and scientific agriculture, from the meetings of which all discussion of political subjects which occupied, or were about to occupy the attention of Parliament, should be carefully excluded. The desire was participated in by many present; and as it was one expressed by a nobleman who has all his life proved the profession of his love for agriculture by his own successful example, we may feel assured he would not so publicly have expressed that desire without intending soon to give the agriculturists of England an opportunity of seconding him in its fulfilment. In consequence, many eminent noblemen and gentlemen held a meeting for the purpose of forming a society on that principle in the Freemason's Tavern, London, on the 9th May; and a wish was expressed at the meeting, that the constitution of the new society should be framed and executed on the model of the Highland and Agricultural Society of Scotland. These resolutions which form the basis of the society were adopted:—

"That it be a fundamental law of the Society, that no question be discussed at any of its meetings of a political tendency; or which shall refer to any matter to be brought forward or pending in either of the Houses of Parliament.

"That the Society shall consist of two classes of subscribers. The one to be called Governors, subscribing annually L.5; the other, Members, subscribing annually L.1; either the one or the other to be permitted to become Governors or Members for their lives by the payment in one sum of the amount of ten annual subscriptions.

---

speedily all organized matter in a state of decomposition. Insects, moreover, do not "multiply" in the winter season in this country; a perusal of page 10 of this number of the journal will satisfy Mr Balden what degree of cold insects can endure, and yet retain their vitality; and the instinct of all animals which hybernate in the ground forewarns them to burrow deep enough beyond the reach of danger. At page 77 of this number will be found a *fact*, though not discovered in this country, which militates against the practice of earthing up potatoes. It is therefore undeniable, when opposite practices produce similar results, that the subject of the potato culture is yet quite open to the experimenter. Experiment on it by all possible varieties of ways is our advice; and when a sufficiency of facts have been collected, we shall then, but not till then, be warranted in theorizing on the nature of the potato plant.—Editor.

"That with a view to effect the objects of the Society, annual meetings be held successively in different parts of England and Wales."

A hope was also expressed at the meeting, that the society would become the recipient of agricultural information, and the means of disseminating it by cheap publications to all parts of the country.

It cannot be denied that the institution of a society based on these resolutions, involves an implied censure on the conduct of the Central Agricultural Society of Great Britain and Ireland, which was instituted a few years ago, on the comprehensive basis of "protection and encouragement to agriculture;"—protection to agriculture, by proposing or defending every proposition of political policy which might tend to promote, and of opposing every such proposition which might tend to injure, the true interests and social condition of the farmer and his labourers;—encouragement to agriculture by promoting the superior culture of those crops and live stock which would return the greatest profit to the industry of the farmer. Now why should any censure be expressed or even implied against a society founded for the express purpose of prosecuting those desirable objects?

It appears that, in pursuance of one of these objects, namely, the protecting of the agricultural policy of the country, the society made strenuous efforts to induce Parliament to abrogate the present laws on the currency, and to establish others in their stead, which they conceived would be more conducive to the public welfare. It appears, however, that in attempting to obtain this much desired object, it happened to excite the opposition of some, and even to provoke the ire of other agriculturists who took quite opposite views of the same question; for the agricultural class, like every other class of the community, has always been strongly divided in opinion on the question of changing the present currency laws. Meanwhile, it also appears that the society raised against itself the hostility of those agriculturists who were indifferent to the currency question, by neglecting, either from the want of funds or of leisure, or from both, to prosecute the other great branch of its duties, namely, encouragement to practical agriculture. It had never offered a premium or held a show for improved culture on live-stock. Thus it appears to have attempted to do that, in the policy of prosecuting which the agriculturists were divided, and to have left undone that in which they might have all acquiesced. Unfortunately, too, for the independent position which the society assumed in regard to party politics, its views of the currency coincided exactly with those of one of the political parties in the state. The result of the combination of all these untoward circumstances was, that a strong and unfavourable impression went abroad against its general utility; and whenever an unfavourable impression goes abroad against a young society, its weight and influence are insufficient to counteract its hurtful tendency, and indeed the attempt to maintain the society any longer in existence is an instance of questionable policy. Whatever may be the attempts made to recover its lost influence, the society is virtually dissolved for good, and another has been instituted, not on *opposite* principles, but on a singleness of purpose.

The experiment of the Central Society has proved the impossibility of conjoining the peaceful prosecution of field-improvement, with the turbulence of political strife. It may be difficult to comprehend why political discussion and discussions on policy, which are as wide as the poles asunder, are inseparable; yet so the fact is, and in this country of fierce political partisanship, they cannot be, they never have been, separated. This state of parties is certainly to be deplored, but until we get another atmosphere than a political one to breathe in, we should not expect to hear, or to partake of calm discussion on any subject which bears a relation to politics. But of all subjects that of the currency has been a bone of contention between political parties ever since 1819, and to have chosen it as an earnest of a profession of independence of all political parties, was an irretrievable error, and a very obvious mistake.

In this unfortunate state of matters for the sake of English agriculture, we rejoice at the institution of the English Agricultural Society, whose sole object is to promote the improvement of practical agriculture. Its scene of operations is on the broad plains of England; and its occupation will endure as long as the life-blood of that noble country continues to flow in the veins of Englishmen. In pursuing "the noiseless tenor of its way" in field-culture, it may lay the foundation of inexhaustible resources in the soil, which will develop themselves, it may be slowly, but at a speedier rate than the demand for subsistence increases by the natural addition to population. Plenty and cheapness of food thus combined would not only tend to produce contentment, but, in conjunction with a Christian education, could not fail to elevate the social condition of our countrymen.

We own we should also rejoice to hear the funeral knell of the Central Society, because the ground would then again be unoccupied for the institution of a society whose sole object should be to afford political protection to agriculture. To avoid all possible collision again betwixt agriculture and politics, let no society ever attempt to unite them as the Central Society has done. We were certain the fate which has befallen that society would occur ere long. Let its members immediately institute a society for the special purpose of discussing every subject of political policy affecting agriculture. Such a society is really wanted in this country at all times, where the monied interest is constantly endeavouring to monopolise all political influence, and to depreciate the labour of poor workmen. Unless a strenuous exertion is made by the landed interest to counteract this baneful influence, by restoring the lost balance betwixt property and its representative, and betwixt labour and profit, mammon will inevitably make both real property and labour subservient to its own purposes of domination. Let no time then be lost in forming such a society, and, though it may be inefficient for a time, it may be ready armed cap-a-pie by the next session of Parliament.

Let the present Central Society be abandoned : it aims to effect too much, to combine incongruous materials. It should the more especially be discountenanced after the imprudences lately committed by its members. It was a pitiful display of bad taste in them, seasoned with a spice of mischief, to attempt to disturb the harmony of a meeting called together for a special purpose. It was sheer unfairness that prompted the assertion, that the British farmer was prevented stating his case, and being listened to at the meeting. It was a gratuitous un-truth to say the meeting was convened for delusive purposes. The meeting, as we believe, was sincerely called together, and after all effected its purpose of forming a society for the encouragement of practical and scientific agriculture; and we have no doubt, if it rigidly adheres to its fundamental rules, it will effect much good in the agriculture of England.

Destruction of Shrubs.—The late winter has occasioned the destruction of many of the finest shrubs, both deciduous and evergreen. In the Horticultural Garden at Edinburgh, several hundreds perished. It was remarked by the acute Superintendent, Mr James Macnab, that the immediate cause of death was to be found, not in the deep snow, nor in the severity of the frost while the snow continued; but in the following circumstance: while snow is falling during wind, an eddy is formed around any upright stem, and a kind of cup is produced. When a thaw occurs this cup speedily becomes filled with water. Matters were exactly in this last mentioned predicament in the beginning of March, when intense frost came on, the mercury in Fahrenheit's thermometer falling to 10° in one night. In this way the bark of the stems was rent by the expansive force of the freezing, and the very vesicles of the plant were also burst, so that death inevitably followed.

The Grinding Bill.—The holders of foreign corn in bond have complained of it as a hardship, that, while our West India colonies are supplied with flour chiefly from America and the Continent, they should be prohibited grinding their bonded corn, and exporting the flour to any desirable market. They say that ships, rather than go to the West Indies in ballast, if they cannot obtain other freights, go to the continental ports in the north of Europe for flour. Now, were they permitted, it is argued, to ship flour in our own ports, made from foreign wheat that would otherwise lie unused in bond, ships would be saved the trouble and expense of going for flour to the northern ports of Europe. It is also said, that, were biscuits permitted to be baked of the flour from the foreign wheat in bond, those ships which take in supplies of biscuit in foreign ports, would supply themselves in our own ports with biscuits baked in bond. These representations appear to be founded in fact, and the complaints originating from them are certainly of sufficient importance to deserve consideration. It must be premised, however, that such complaints were never seriously urged until a failure took place in the crops of the United States for two successive years. The States used to supply our West India colonies with flour of their own manufacture; but when their crops failed, the failure being unaccountably universal over that extensive country, the West India islands, and other parts of North and South America, were supplied with flour from Europe. This trade having once been attempted, will be very reluctantly relinquished in Europe, so that the question of permitting the grinding here of the foreign wheat in bond, resolves itself into a competition betwixt the States and Europe. Should the crops of the States become again as prolific as they used to be, and there is nothing improbable in the supposition, it is next to an impossibility that the States will not be again able to supply flour to the markets along the shores and islands of the American continent as reasonably as they used to do, and, most probably, more reasonably than European nations can do who are situated at a great distance from those markets, inasmuch as the States formerly pursued this trade successfully, undisturbed, and would have continued to pursue it, had it not been for the failure of their own crops. As to the possibility of this country entering into a successful competition with the States, it is clear that, if the foreign wheat has first to be brought to this country, and placed in bond before it is ground into flour, neither that flour, nor the biscuit made from it, can be supplied at so reasonable a rate as the same articles can be by the corn-growing countries of Europe, where the article manufactured is grown on the spot. Inasmuch, therefore, as the grinding of foreign wheat, and the baking of biscuit of the flour of it, are desired to be prosecuted as a trade in this country in the face of an overwhelming competition, the desire to establish a trade in such circumstances must arise from some other motive than the sake of the dubious profit to be derived from its prosecution.

Such suspicions were excited in the minds of the agriculturists at the first attempt of introducing a bill on this subject three years ago; and every circumstance since then, including the innocent-looking bill of Colonel Seale, have only tended to confirm the probability of those suspicions. One circumstance that looked suspicious in regard to the sincerity of the bills, was the attempt to elevate their object to a national importance. It was alleged that the permission to grind foreign wheat in bond would remove the oppressive effect which accumulated grain has always upon prices;—that it would greatly benefit the shipping interest by the employment and victualling of ships;—and that it would employ the industry of our own instead of that of the continental millers and bakers.

The permission to grind foreign wheat in bond would no doubt liberate the foreign corn *at present* in bond, provided the competition could likely be maintained against foreign flour. That might perhaps be maintained for a short time, but a good crop in America this season would inevitably render it a hopeless speculation; but as to the permission loosening the hands of speculators in foreign corn, in order they might enter as purchasers into our own markets, that would never take place, so long as it is possible to derive a profit from the import of foreign corn. So far, however, from it being likely that the bonded granaries would be empty for any length of time, we understand large purchases have lately been made abroad in expectation of Seale's bill passing both houses of Parliament. Ships would in no way be greatly benefited by the measure, and only in a slight degree by their being supplied with biscuits made in bond instead of biscuits of home flour. This benefit would be derived in direct contravention of the corn laws, and in direct violation of the solemn assurance that the grinding bill was not intended at all to interfere with those laws. As to the shipping interest, it already enjoys the privilege of supplying our West India and other colonies with flour and other commodities, to the exclusion of foreign bottoms; and although it might be more convenient to take in cargoes of flour in our own ports, instead of going for them to the ports of northern Europe, yet in the latter the flour may be procured for shipment, and the biscuits for victuallin lower rates than in this country. As to the employme more millers and bakers, the increased number could no so great as to render it an object of any importance; but probability is, that some of the present millers and ba would apply to have the privileges of bond conferred on t present premises.

But the most serious objection against the grinding which are founded on the probability of fraud, remain tc enumerated. Corn was to be permitted to go out of b and taken to licensed mills, where it may remain two mon but where it does not appear to be under the superintend of any accredited officer. After being two months in the m the corn may again be returned into bond, or its produc flour or biscuit placed in bond. Now, who can tell what qu tity of flour, much less of biscuit, should be derived fro given quantity of foreign wheat? There is a penalty, tc sure, of L.5 for every quarter that is not exported; but is to ascertain the relative quantities of wheat, flour, and cuit, in a quarter of wheat, and who to sue for the penalt The only interest to sue for the penalties is the landed; is it fair that they should become common informers ere a nalty can be sued for? It is not very clear whether the obliges the exportation of bran; and yet, were it dispose in this country, the corn law would so far not only be viola but it might be a difficult matter to detect the disposal of coarser qualities of flour, both of which might be mixed am the bran, and sifted out after the bran left the bonded m Besides, who is to distinguish between the flour or bis made from foreign wheat from that of wheat or flour of own growth, when it happened to slip into circulation, thro the connivance of the bonded millers or bakers, over wh doings there is no statutory control? These may be sidered unfair suspicions against the working of the bill; after the frauds we have seen committed in the foreign c trade betwixt Guernsey, Jersey, Isle of Man, and Britain, can readily give credence to the possible connivance of fr under Seale's bill, which is at best very loosely drawn up i enactments, which are said to have emanated from the Bo of Trade,—a manufactory of bills whose issues should always be viewed with suspicion by agriculturists.

Corn Laws.—Much novelty of argument cannot now be advanced for or against the corn laws,—a subject that has been discussed for the last two hundred years. But a new objection has been discovered against them; it is asserted that they are as much oppressive to the nation in a pecuniary sense as the national debt; and the argument to prove this assertion is conducted in this way: 52,000,000 quarters of corn of all kinds are annually consumed by the inhabitants of this country; now, as it is admitted that the corn-laws afford a protection to prices to the extent of 12s. per quarter, the inhabitants pay L.31,200,000 a-year more for their bread-corn than it would cost them to purchase it from abroad; and this sum being equal to the interest of the national debt, those laws are, therefore, as inimical to the nation as the national debt itself! "Give me a spot on which to rest my lever," cried Archimedes, "and I will move the globe itself." "Give me my premises," says the modern economo-philosopher, "and I will prove to your entire satisfaction, 'that were the cultivated land of this country entirely destroyed by a great volcanic eruption, the most invaluable benefit would be conferred on the nation!'" Refutation of such assertions would have no effect on the complacency of our modern philosopher, ensconced behind his premises. There he sits, like Arachne in the midst of her meshes, ready to entangle every innocent in search of knowledge, cram him with assertions for premises, and then make a political economist of him.

STABLE ECONOMY.

Stable Economy: A Treatise on the Management of Horses, in relation to Stabling, Grooming, Breeding, Watering, and Working. By J. STEWART, Veterinary Surgeon, and Professor of Veterinary Medicine in the Andersonian University, Glasgow. W. Blackwood and Sons, Edinburgh; and T. Cadell, London. 1838.

A good, practical work, written in a popular style, on rational veterinarian principles, of the treatment of the horse in the stable and the road, has been a desideratum in literature. Bracey Clark, now long ago, made some well-founded strictures on the construction of stables, which were, at that period, really sad receptacles for the abode of any living creature; and his remarks no doubt effected some good, by directing the attention of the owners of horses to their amendment; but since then, veterinary science having made very rapid progress toward perfection, the construction of stables adapted to a more perfect knowledge of the horse, is now much better understood. Nimrod, on the condition of hunters, has, in his own fascinating language, told us all that is requisite for the comfortable treatment of that valuable and indispensable class of horses to the country gentlemen. The racer, too,—which, like our inimitable constitution, was once the pride of this nation, and still the envy and desire of other nations, but now, it seems a stiver is of more value than a stud,—has had its historians and training-grooms, in Darvill and others. But for the cheerful and companionable roadster; the steady and pleasant single harness horse,—snug in its place in the tilbury, but far otherwise in the cruelty-van; the proud and lofty carriage-horse; the quick and bustling poster and coach-horse; and the trusty and tractable plough and dray-horse,—no pen has been employed to plead for them kind treatment, at home or abroad, in shelter or exposed to the vicissitudes of the seasons.

Judging from the very opposite treatment individually given to horses of the same class, the fast-going, for example, we would be apt to conclude, that the similar anatomical structure of different horses had to perform quite opposite functions. Some of that class are housed in stables little closer than sheds, whose interiors are accessible alike to heat and cold, rain and drought. Whilst others are confined in plastered apartments, every chink of which is carefully stopped up, and the air in their interiors always feeling steamed and confined like that in a hot-house. It is clear the same treatment in both these states, cannot alike promote the functions of the animal frame. If the one is conducive, the other must be inimical, to the preservation of health; but the fact is, both are alike injurious to the well-being of the horse. It is with his treatment, as with our own rule of life, *virtus stat in medio.* No doubt the horses' food should be constituted so as best to support his health and strength in the fulfilment of the peculiar work appointed him to perform, but the animal functions of all horses being alike, parts of treatment should be conducted on principles common to all; thus all stables should be equally comfortable, treatment of horses in them equally attentive, their guidance at work equally skilful, and safety after work equally to be studied. Refinements, indeed, may be introduced into all these departments of management, to please the peculiar tastes of the owners of horses, but in the administration of what may be termed luxuries, the tendency to promote the natural functions of the animal should always form the test of the propriety of their use. Were all horses treated on natural, and therefore rational, principles, and there is no insuperable barrier against their adoption in the horses themselves, the highest pleasure and satisfaction in the use of horses would not only be constantly derived, but those delights would be conferred for lengthened periods, and the horses would exhibit continued soundness, and perform their most arduous tasks with tractability and liveliness. There would then be as great difficulty in finding an unsound, as there is at present in procuring a sound horse. Unsoundness and vice would form the exception, soundness and docility the rule.

With these convictions on our minds, we were glad to meet Mr Stewart's work, for we verily believe, were his directions, opinions, and hints universally adopted, based as they are on sound and extensive veterinary experience,—and we maintain a veterinarian alone can write a really practically useful work on the general treatment of the horse,—our anticipations would not be far from being realized; at all events, the noble animal we are speaking of would then be rationally, mercifully, and kindly treated. This would be to attain, if not all that is desirable, very much of what is desirable, in the improved condition of the horse.

In a work abounding as this is with remarks and reasonings on a multiplicity of facts, which digress into collateral subjects, it is difficult to select conveniently short passages for extracts; and, on the other hand, a bare recital of the subjects treated of in the various chapters, would excite little interest in our readers. In such a predicament, we believe, the best advice we can give our readers, is to buy the book, read it attentively, and judge of it for themselves. They will find a great deal of useful matter in apparently a small volume, and all worthy of a thoughtful perusal. Sure we are, the loss will be his own, if every owner of a horse, who has any regard for his welfare, does not peruse it attentively.

His remarks on the present fashionable practice of *clipping* may prove attractive. "This operation has truly been termed 'a bad substitute for good grooming!' It is done only on the better kind of horses, especially upon hunters, and consists in shortening the hair all over the body, by means of the scissors and comb. The object is to make the winter coat as short as that of summer. The time usually chosen is the beginning of winter, just after the horse has moulted, and before his coat has attained its full length; but it may be done at any later period, greater care being taken to prevent the horse catching cold. Of the mode in which the operation is performed, I need say nothing. There are persons in all considerable towns who make it their business. Private grooms sometimes attempt it, but they seldom do it neatly. The horse requires no preparation. For several days after, he must be well clothed, both in the stable and at exercise. He may be ridden the next day, but he must not be exposed while naked, wet, or motionless. He should not be clipped when unwell. If he have any cough, sore throat, discharge from the nose, or tendency to shiver after drinking, those should be removed before he is clipped. He should not have any physic immediately before nor after. When he goes to the forge or to exercise after the operation, he should be well clothed. A double blanket, a hood, and breast-piece are requisite.

"*Utility of Clipping.*—Some people dislike the appearance of a clipped horse; and it must be confessed, that while some are improved by the operation, others look very ill. Nevertheless, it is to please the eye that clipping is performed. So long as nothing was said against the practice, it had no higher pretensions. They that first tried it had no other object. They did not expect it to exercise any influence upon the comfort or health of the horse, and they did not recommend it as contributing to either the one or the other. But at a later period, that is, after the operation had been patronised by those whom it would be sinful not to imitate, attempts were made to shew, that clipping did something more than please the eye. It was urged, and with perfect truth, that it diminishes the labour of the groom, and prevents the horse from sweating in the stable. As if this were not sufficient, other arguments were brought forward in favour of clipping. It was said the horse becomes lighter by a pound, about the weight of the hair he loses; that the stomach, bowels, liver, and lungs, derive some benefit from the extra-dressing which the skin obtains, in consequence of being more easily reached by the brush, and that the horse perspires less at work.

"Much of what I have said upon trimming is applicable to clipping. If the owner cannot suffer a long coat of hair, and will have it shortened, he must never allow the horse to be motionless while he is wet, or exposed to a cold blast. He must have a good groom and a good stable. Those who have both seldom has a horse that requires clipping, but, when clipped, he must not want either. A long coat takes up a deal of moisture, and is difficult to dry; but, whether wet or dry, it affords some defence to the skin, which is laid bare to every breath of air when deprived of its natural covering. Every one must know from himself whether wet clothing and a wet skin, or no clothing and a wet skin, is the most disagreeable and dangerous. It is true that clipping saves the groom a great deal of labour. He can dry the horse in half the time, and with less than half the exertion which a long coat requires; but it makes his attention and activity more necessary, for the horse is almost sure to catch cold if not dried immediately. When well clothed with hair, he is in less danger, and not so much dependent upon the care of his groom.

"*Objections to Clipping.*—Some, as I have just observed, dislike the look of a clipped horse. This is no objection to the operation. As a matter of taste, it is needless to say any thing, either for or against it. There are no arguments for persuading men to admire that which offends the eye. The clipped horse has a different colour; the hair is lighter; a black becomes a rusty brown; the hair stares, stands on end, and is never, or very seldom, glossy. But the only real objections to clipping are these: It costs two guineas or thereabouts; it renders the horse very liable to catch cold; and it exposes the skin so much, that he is apt to refuse a rough fence in fear of thorns. There is not the slightest reason for supposing, as has been supposed, that it produces blindness, or has any tendency to shorten the duration of life. The cost of the operation, and the additional care which the horse requires, are, I believe, the principal objections; and, considering how little is gained, they will probably prevent the operation from ever becoming very general. There are some horses which wear a long rough coat all the year. The groom, with all his care, and the best of stables, cannot keep it within reasonable bounds. For these horses, if a long coat is a great eyesore, there is no remedy save clipping. But there are very many horses clipped, to whom the operation would be quite necessary, were they better groomed, and well stabled. Since a fine coat is an object of so much importance, it is well to know by what means it may be obtained. When these are more generally known, there will be less clipping."

The collateral subject, for the attainment of which clipping is practised, namely, "How to give the horse a fine coat," is then detailed at considerable length. Some people are very eager to turn out their horse to a straw-yard all winter, which they imagine will cure even a Lazarus of all his evils; but the true motive is to save their own pockets. Let them cogitate on this, and then uphold the winter fashion if they please.

"Horses are sometimes turned out all winter to a place called a straw-yard. It is, properly speaking, a manure-yard, a dung-pit, a place fitter for manufacturing manure than for lodging horses. It often contains oxen, calves, colts, and swine, as well as horses. It is generally destitute of shelter, and the food consists of straw and hay, or of straw only. Often there is not even an allowance of water, except when the man finds it convenient and not disagreeable to carry it. People who bargain for a winter's run, or imprisonment in a straw-yard, do sometimes pay for a small daily allowance for corn, which, however, is not always given.

"A winter's keep in the straw-yard is going a good deal out of fashion, at least with people not themselves proprietors of such a place. But it is still too common. The horse is not wanted till spring, or perhaps some lameness requires rest for two or three months; and as he can be kept in a straw-yard at little cost, to that place he is sent, abandoned to neglect, and frequently to treatment worse than neglect. He returns home a skeleton; he has a cough, which is cured with difficulty, or not at all; his feet are destroyed by thrushes; his skin is covered by lice, and his bowels are full of worms.

"When the horse must be sent to such a filthy place, he needs neither physic nor bleeding. However lusty, he will require all the blood and flesh he can carry before winter expires. The only preparation he requires refers to the feet, and to temperature. The frogs should be coated with pitch or tar. If very thrushy, they should be covered with leather soles, well stopped up. The horse should be well inured to cold. He needs more preparation than when going to grass. A straw-yard does not demand nor permit the exercise which a pasture horse must take. When he returns, he must be treated in nearly the same way as after a winter's run at grass. More time is necessary to confer working condition; and greater care regarding hot stables. Some treatment will probably be requisite to remove lice, and expel worms.

"Every straw-yard should have a covered shed, dry and clean. It should have a constant supply of water, which should be entirely changed every day, and placed in elevated troughs, that it may not receive the evacuations. The fodder should be placed in racks under cover, and the owner should visit his horse every now and then."

ON AGRICULTURAL CHEMISTRY.

By Mr Henry R. Madden, Edinburgh.

Having paid considerable attention of late to Agricultural Chemistry, I am much astonished to find that no one (if we except the original founder of the science, Sir Humphrey Davy) has attempted to draw together all the facts which have been made known in connection with that science through the medium of the numerous periodicals, manuals, &c., which treat of agriculture and similar subjects; on which account it is totally impossible for any one engaged in the operations of the field to become acquainted with the many and valuable improvements which have been made in this art by scientific men both at home and abroad. Being at the same time fully aware that of all the agricultural periodicals this is the most valuable, and also the one which is most extensively read by practical men, I shall esteem it a great favour if its readers will give me their attention while I lay before them, as far as is in my power, a condensed view of all that has been done by science to the advancement of agriculture; which purpose, it appears to me, would be best attained by going regularly over the whole subject, and pointing out how far each and all of the various branches of this inestimable art have been, and still may be, benefited by the labours of those devoted to scientific pursuits. This I shall endeavour to accomplish by means of a series of papers on Agricultural Chemistry; choosing that name in preference to any other, as there can be no doubt (as the sequel will amply prove) that chemistry, of all the sciences, has contributed most to the improvement of the art of cultivating the soil. Without further preliminary, therefore, I shall commence by introducing myself to my readers, and laying before them in general terms the many advantages to be derived from investigating scientifically those results, which many of them have hitherto probably regarded in a purely practical sense.

It must be obvious to all those who interest themselves about the agriculture of this country, that although much appears to have been done by various individuals towards the improvement of the different branches of this art, nevertheless the general feature of the agriculture of the kingdom, *taken as a whole*, appears, with a few exceptions, to have undergone no material change for some years past; and it is a question which naturally suggests itself, what is the cause of the great length of time which elapses between the publication of a discovery and its general adoption? Is it ignorance? some will ask. Is it disinclination? Is it obstinacy? or what is it? That each and all of these surmises may be applicable in particular cases there can be little doubt; but far be it from me to censure the class of farmers so much, as to assert that this is by any means generally the case. No! I am convinced that the cause is to be sought for elsewhere. There is an old adage, "A burnt child dreads the fire," and upon this principle, I think, a great deal of the reluctancy shewn by farmers in adopting new discoveries is to be explained. It must be well known to all those connected with the operations of the field, that most of the cultivators in our country are directly dependent upon the produce of their soil for the food they eat, and it is certainly not to be expected that these men should risk a whole year's labour merely because they have *read* of a better way of cultivating their crops. If all that has been written on the subject of agriculture could be implicitly depended on, then certainly farmers would be culpably blind to their own interests in not adopting all published improvements which their means would permit. But unfortunately this is far from being the case, and there can be no doubt that many losses are annually sustained by those men who are led away by every new idea which they either hear or read of. I need not say that this is a state of matters deeply to be regretted by all those who interest themselves in rural affairs, and a remedy against it is earnestly to be sought for. I feel convinced therefore, that my readers will excuse my allotting a short space to the consideration of a subject at once so interesting and important. *First*, let me warn all practical men from coming to too hasty a conclusion as to the value or inutility of any published improvement; for there can be no doubt that much harm has been done to the advancement both of scientific and practical agriculture, by the publication of different methods of cultivation before their value has been sufficiently ascertained; and also by persons adopting improvements, which have been well examined into, but at the same time endeavouring to put them into practice themselves, when from ignorance of the sciences on which their success depends, they are totally incapable of giving them a fair chance.

Secondly, Many men investigate various branches of this art, and come to valuable conclusions, but from the same circumstance as the one above mentioned, they are either totally incapable of communicating their discovery to the world; or if they publish at all, many circumstances escape their notice, which, if not accurately known and attended to, may be the cause of the most direful results to those who attempt to adopt the same practice. This I shall be able to make more intelligible by means of an example. Let us suppose a case. A farmer who is well acquainted with the external characters of soil, but totally ignorant of *chemistry*, is extensively engaged in practice, and finds that some sandy soil of his is so loose and hungry, that the crops on that part of his farm are never good; he naturally asks himself, how shall I remedy this? He looks into some treatise on agriculture, and finds that *the texture and fertility of light and hungry soils are much improved by a good dressing of rich clay-marl.* He, of course, at once proceeds to look for clay-marl; he finds it, and applies it largely to his land; the next year he finds that his crops are most wonderfully improved, in fact are better probably than all the rest on his farm, and in the fulness of his joy he informs all his friends, that of all the applications to bad sandy soil clay-marl is the best. Well, but let us suppose further, that from some circumstance or another he is obliged to change his residence; on his new farm he finds precisely the same kind of soil as on the last, and he likewise meets with clay-marl to all appearance similar to the former. He of course applies it, and sows his oats or turnips, or whatever crop he chooses, with the full assurance that he has performed a cure; but to his great astonishment and dismay his crops totally fail, and it requires years for the land to regain even its original state of fertility. Now such a case might easily occur, for it is a well known fact that some marls are most destructive to fertility, unless frequently turned and freely exposed to the air before they are used, while others may be applied directly; and it is equally clear that chemical analysis is the readiest, if not the only way of distinguishing them from one another. Similar cases might be mentioned with reference to lime, as it is well known that the *magnesian* limestone, if applied recent, is most injurious to vegetation, and in this instance, as with the marl, chemical analysis is the easiest and surest method of detecting the presence of the enemy.

Thirdly, Scientific men are apt to trust too much to their own abilities, and to conceive that they can sit in their closets and write upon agricultural matters, and publish new schemes of improvement, without once attempting to put them into practice themselves. I need hardly say that such a procedure is sure to be the cause of failure and disappointment to those who follow the dictates of such men. Nor will it less certainly tend to bring distrust upon science in general, and in this manner many clever well-meaning men have actually done more harm than good by their writings.

Fourthly, Practical men, who having an inclination for philosophical research, but still are not possessed of sufficient leisure time to study the subject thoroughly, frequently endeavour to adopt scientific language in their writings, but from their own ignorance, speak so loosely and confusedly, that should any one who truly understands the matter meet with their writings, he will be apt to regard them rather as the speculations of a visionary than the productions of a sound reasoner and able experimentalist.

Fifthly, Many of the poorer classes of farmers, both from the remoteness of their dwellings, and the deficiency of their means, are unable to hear what is going on around them, except through the medium of newspapers and market-day gossip, neither of which sources of information are well calculated to be implicitly trust-worthy; for the first, namely, the newspapers, are unfortunately too often made the unwitting propagators of the most incorrect statements; and in the second case, viz. by conversation, amid the bustle of buying and selling, the old adage of "a tale never loses by telling," is much too notorious to require repetition.

And, *lastly*, the same class of farmers, however willing they may be to improve their farms, are frequently prevented from doing so for the want of the co-operation of their landlords. Many other reasons might be brought forward on the subject, but I shall not occupy the time of my reader by being needlessly prolix.

I have thus given six reasons, which tend greatly to deter the improvement of agriculture in this country; the important question, therefore, comes to be, Is there any manner of overcoming these? After having maturely considered this subject, I have come to the conclusion that, in the present state of things, it appears perfectly impossible; but, nevertheless, I think that such an alteration might be made, which would at once do away with all the objections, and at the same time tend greatly to advance agriculture as a science. The method I should propose is the following:—The agricultural districts of the three kingdoms might be divided into sections, and the farmers of each section might by subscribing together (which would be a mere mite to each) raise an annuity sufficient to support a superintendent, whose duty it should be to make himself thoroughly acquainted with all the newest published facts, in order to promote the agricultural interests of his section; that this person should dwell in some central situation, in order that he might make a survey of all the farms in his district at least once a-year; that he should be intimately acquainted not only with practical and scientific agriculture, but with chemistry, geology, natural and mechanical philosophy, meteorology, natural history, and botany; by means of which qualifications he would be enabled to make himself useful in all cases of difficulty which occurred in his district. In this manner all new improvements would be immediately ascertained, and thoroughly investigated by scientific men; and might be made public in the pages of this journal, and the whole country would therefore feel at once the benefit of all discoveries; besides, the agricultural youth would be thus enabled to receive a much more perfect education than can be obtained at present, except at a great expense. Should this scheme meet with the approval of any of those more immediately connected with the matter, I shall be most happy to enlarge upon the subject, and to state many minutiæ which would be very much out of place here. I shall, therefore, say nothing further at present, but proceed at once to the more immediate matter of the paper.

"Agricultural Chemistry," remarks Sir Humphrey Davy, "has for its objects all those changes in the arrangements of matter connected with growth and nourishment of plants, the comparative values of produce as food, the constitution of soils, and the manner in which lands are enriched by manure, or rendered fertile by different processes of cultivation." Taking this as my text, I shall endeavour, in the first place, to point out the great extent of the science, and its evident importance to the farmer. From the sentence above quoted, it is evident that the illustrious author includes under the title of Agricultural Chemistry, part at least of the following sciences:—Chemistry, geology, vegetable physiology, and scientific agriculture; in fact, he intends the science to embrace all the circumstances connected with the preparation of the soil, from the most barren earth to the richest loam; all the changes which take place from the sowing of the seed to the maturity of the crop; and likewise an investigation into all the economical properties of the plants themselves. Now taking this view of the matter, I cannot conceive that any farmer will presume to question its utility.

Let us commence, therefore, the arduous undertaking of giving a condensed view of so extensive a subject, and since there is no doubt that the science is as yet in its infancy, this sketch will of course be very imperfect; I shall strive, however, to collect together as many facts as possible, and likewise to point out, as far as is in my power, what researches should be most carefully pursued in order to extend our knowledge in this important branch of learning. *Soil*, in a chemical point of view, is found to consist of very few substances, the chief of which are, *silica*, or the matter of flints; *alumina*, or pure clay; *chalk;* a small portion of *iron;* and sometimes *magnesia*. These substances appear very seldom to be united chemically, but are in general mere mechanical mixtures. In addition, all soils which are not absolutely barren, contain organic matter derived both from the animal and vegetable kingdoms; these together with iron, evidently give the colour to soil, since the other ingredients, namely, *silica*, *alumina*, *carbonate of lime* (*chalk*), and *magnesia*, are when pure perfectly white. I do not intend entering here upon a long account of the chemical properties of these various substances, as I conceive that it is not a subject likely to interest at least the generality of the readers of this Journal; their mechanical properties, however, are so intimately connected with the value of the soils they compose, that it is absolutely necessary to have a clear understanding of them before we proceed farther.

Silica, or in strict chemical language *silicic acid* (for all its relations are those of an acid), is one of the most abundant products in nature, there being hardly a piece of earth, pebble, or rock to be met with, which does not contain it in greater or less quantity. It exists in a tolerable state of purity in sea and river sand, and is found nearly chemically pure in *rock crystal.* When prepared in the laboratory of the chemist, it is generally obtained in the form of a light dry powder of snowy-whiteness, which, however, feels gritty between the fingers; it is possessed of neither taste nor smell, and except under peculiar circumstances is totally insoluble in water. Particles of silica even when moistened, cannot be made to adhere together so as to form a plastic mass; on which account all siliceous or sandy soils, whether wet or dry, are always loose.

Alumina, in point of frequency, stands next to silica; it is found nearly pure in nature in the *ruby* and *sapphire*, two of the most beautiful gems we possess. To one unacquainted with chemistry I have no doubt that it will appear extraordinary, that the most precious ruby should be composed of the same substance as a common *tobacco pipe*, but nevertheless such is actually the case. This earth when prepared by the chemist exists in two distinct forms, the one a light dry powder not unlike the last, the other combined with water, in which case it forms a white gelatinous mass similar to thick starch. In soils this substance never occurs uncombined with water, and consequently its particles always adhere together; hence clayey soils are at all times cohesive.

Carbonate of lime or *chalk* is by no means so common as the two former ingredients, but nevertheless there are few soils which absolutely want it. In nature, it is found nearly pure in the form of *Iceland spar*, *white marble*, &c. This substance absorbs water, and retains it, without however becoming cohesive in any great degree; on this account, lime may be used to increase the friability of stiff clays, without at the same time diminishing their power of absorbing moisture; and also, it is pre-eminently useful to increase the absorbent powers of sandy soils, without altering their texture. This substance is composed of the well-known body *lime*, combined with a gas named *carbonic acid*, or that gas which forms the *choke-damp* of miners. When *chalk* is exposed to heat, as in a lime-kiln, it loses this gas, and is then reduced to the state of *pure lime*, the characters of which substance are much too familiar to require any detailed description. I need only mention, that so great is the attraction between lime and carbonic acid, that they cannot come in contact without uniting; and since this gas always exists in the atmosphere, lime cannot be exposed for any length of time without being reconverted into chalk, which change is well known to agriculturists, and is explained in general terms by saying that *hot* lime becomes *mild* by exposure.

Magnesia exists in some soils only, and the few remarks which it will be necessary to make concerning it, as they refer entirely to its effects on vegetation, will be better understood when treating of mineral manures.

Iron exists in the soil in the state of an *oxide*, or the metal united with that elementary body, distinguished by chemists by the name of *oxygen* or *pure air*. The metal, combined with this gas, forms the familiar substance *rust*, which is actually the state in which it exists in almost all soils. This substance, however, never occurs in any considerable quantity in fertile soils. In its natural state it is insoluble in water; it is however frequently, when rendered soluble by means of acids, the cause of sterility.

Organic matter exists in soils in various proportions, from a mere trace, as in the almost barren sands, to upwards of 90 per cent., as in peat. But it may be in such a state as to be absolutely injurious to vegetation, instead of useful. The examination of the point, in what state the organic matter of soil must be, to become available as food for plants, will be much better considered afterwards.

Having now given a brief sketch of the various substances contained in soil, I shall proceed to examine the various forms under which soil appears, according to the proportion in which these ingredients exist; or, in other words, I shall consider the classification of soils.

First, however, let us shortly consider the question—what is the origin of soil? How was it first produced? This is a point on which there is but little difference of opinion, by far the most general belief being, that soil is formed by the gradual disintegration or powdering of the rocks in the neighbourhood, and the mixing with them all the vegetable remains which have been produced by the decomposition of the different generations of plants, which have grown there since the beginning of vegetable existence. Now, as far as regards sandy and gravelly soils, I have no doubt that the statement is correct; but the remarks which I have made, in reference to alumina, will, I think, point out sufficiently clearly, that these soils at least derive their origin from water. For, since all the alumina in soil is *combined with water*, and that of most rocks is *deprived* of that substance; and since, moreover, it has hitherto baffled all the attempts of chemists to make the *dry* alumina unite with water, except through the medium of some chemical solvent, it is perfectly clear that those rocks only could yield clayey soils which contain the clay already in the form of a *hydrate*. Again, the *situation* of such soils, namely, carses and the flat banks of rivers, seems to favour this opinion. Be this, however, as it may, the chief thing which interests us is the fact, that soils are naturally divided into clays and sands. To give particular descriptions of these would be superfluous, but still a few words must be said, in order that my readers may know exactly what terms I apply to the different kinds of soil; these terms are nearly the same as those used in Low's Practical Agriculture. First, then, soils may be divided, according to their texture, into stiff or heavy, and light or loose; according to fertility, into rich and poor; and, with reference to moisture, into wet and dry. These different genera of soils have been divided into numerous species and varieties; but, however interesting these may be to scientific agriculturists, they are not of any very great importance to those engaged in practice. The following will, I think, comprehend all the varieties which it will be necessary to remember.

I. *Clayey Soils.*

1. Stiff cold clay; including the poor, uncultivated soils of this nature, consisting nearly of pure clay.
2. Clay loams; including all the richer clays, and, of course, having a due admixture of silica.

II. *Sandy Soils.*

1. Loose and hungry siliceous sands; including all the poorest kinds of sand, containing little or no alumina.
2. Poor calcareous sands; comprising those which have a considerable quantity of calcareous matter, but little alumina.
3. Rich sandy loams; comprising all the fertile soils of that consistence, which contain a certain proportion of alumina, and are seldom without calcareous matter.

I have not denominated any of these soils wet or dry, as I think it is very apt to lead to confusion; for it is self-evident that, were this dependent upon the soils themselves, the clays would be wet and the sands dry, whereas, in many cases, the exact reverse occurs; and, consequently, I consider it better to name the soils after those chemical constituents which they possess, independent of any extraneous circumstances. Were it not liable to this objection, therefore, it is clear, that all the species of soil here enumerated might be further divided into wet and dry, as poor wet calcareous sand, poor dry calcareous sand, &c. In this account, I do not pretend to enter into particulars, as the characters of soil are amply described in all works on agriculture. With regard to subsoils, I shall say nothing at present, as this will come to be considered when I am speaking of draining: suffice it therefore for the present to remark, that, according to whether the subsoil is retentive or loose, so the soil resting on it is wet or dry. I shall also say nothing about the natural produce of the different soils, until I come to treat of agricultural weeds. Let us, therefore, proceed at once to consider, what is necessary in soil to fit it for maintaining vegetable life. This, of course, will lead us first to treat of the food of plants. But since I have already extended this paper to considerable length, I must defer my remarks on this subject until the publication of the next number of this journal.

RETROSPECT OF THE BRITISH AND FOREIGN CORN TRADE, FOR CROP 1837.

By Mr William Gray Fearnside, London.

In a country like Great Britain, whose distinguishing characteristic among the nations of the world, is the pre-eminence of its commerce, it forms the subject of interesting inquiry to every patriotic mind, to investigate, as year succeeds year in the vast cycle of time, the progressive advancement or decline of each branch of its trade. In taking this retrospective review, it is rendered a much more gratifying occupation, if we find proofs afforded of the healthy and prosperous issue which has attended the various operations in detail of any particular traffic; and though perhaps only forming a fractional part of the grand mercantile machinery of the state, yet as tending to strengthen its individual interest in the community, it is to be greeted with satisfaction. How much more, then, must the welfare of the agriculturists, who have so large a stake at risk in the mercantile world, and the successful result of whose adventure has so important an influence on the general weal, form the source of the happiest gratulation to all classes of the community? It is therefore that we now hasten briefly to illustrate the favourable termination of agricultural operations for the year 1837. Without attempting to dwell on the remunerating prices of wool, cursorily observing, that, as we consider the woollen and worsted trades to rest on a more stable foundation than any of their rival loom-working manufactures, and being less dependent on the caprices of fashion and foreign competition than most other branches of industry, we see no reason to apprehend any material stagnation in the demand, nor consequent low prices of that commodity; without discussing either the profitable return obtained by the grazier and breeder of cattle, or the benefits derived from the diminution in the amount of poor's rates, and satisfactory working of the new poor-laws in England, with the additional labour now bestowed upon the land; nor staying to animadvert on the advantages derived from the adoption of a more liberal system on the part of country bankers, in extending temporary pecuniary accommodations, their confidence in the responsibility of farmers having gradually revived; merely noting, that as it has become apparent that the farmer is at present much less lavish in his mode of living, having assumed more the cautious, thrifty character of olden times, while he is improved in his reflective powers by the progress in the education and intellect of the age,—that therefore advances of money are more readily obtained, especially through the increased and improved system of banking establishments, and thus the agriculturist has the satisfaction of feeling that he is not compelled to sacrifice his produce from the want of occasional pecuniary accommodation.

Only looking at these collateral subjects, as all tending to work advantageously to the home producer, we will at once advert to the object, which is more particularly the theme of our review,—that of *grain*. In order to place the subject perspicuously before our readers, we would refer to the annexed numerical account, as indicative of the improved aspect of rural affairs. In noticing the annual fluctuations in the value of wheat, the past year was 7/ per quarter higher than in 1836, and 16/ per quarter above the average of 1835; but in remarking the fluctuations calculated from the lowest average prices, a much greater steadiness is observed prevalent during 1837, than any of the seven previous years, except 1833; and as the current value of the staple commodity more or less influences all other descriptions of agricultural produce, as well as the other necessaries of life, it becomes a tolerably good index of the improved condition of the farmers. The extreme range of the maximum and minimum prices in 1836, exhibit a disparity amounting to the enormous extent of 70½ per cent., affording a remarkable instance of the effects of undue speculation, especially when recollected, that the disparity in price was caused entirely by an incidental occurrence, and over which no previous calculations, however well defined, could have had any control, as the rapid enhancement of the currencies took place at a period when our granaries had been newly replenished with the produce of an average growth of wheat; thus proving to conviction the injurious effects of speculation as the means of disorganizing all regular course of trade, when based on prospective opinions and visionary principles. As, however, relates to 1837, we note, that notwithstanding 232,784 qrs. of foreign and colonial wheat, and 40,481 cwt. of flour have been entered for the home consumption, at the highest range of duty at which foreign corn was ever introduced into our markets, say from 28/8 to 30/8, and a portion at from 31/8 to 33/8, yet the article having been released from bond, more through a speculative than a necessitous expedient, the depression of the native produce was immaterial and of short duration. The following tabular account exemplifies the average price of wheat per quarter, in England and Wales, for the last seven years, together with the highest and lowest average value, shewing, at the same time, the range of fluctuation per cent., calculated on the lowest price.

Years.	Annual average of wheat.	Highest average price.	Lowest average price.	Rate of fluctuation calculated on the lowest price.
	s. d.	s. d.	s. d.	
1831	66 4	75 1	59 2	27 per cent.
1832	58 8	63 7	52 4	21½ ...
1833	52 11	56 5	49 2	14¾ ...
1834	46 2	49 6	40 6	22¼ ...
1835	39 4	43 6	36 0	20¾ ...
1836	48 9	61 9	36 0	70½ ...
1837	55 10	60 1	51 0	17¾ ...

Annual average price of other grain, viz. barley, oats, beans, and pease, during the same period.

Years.	Barley. Per qr.	Oats. Per qr.	Beans. Per qr.	Pease. Per qr.
	s. d.	s. d.	s. d.	s. d.
1831	38 0	25 4	39 10	41 11
1832	33 1	20 5	36 5	37 0
1833	27 6	18 5	35 1	37 0
1834	29 0	20 11	36 7	33 0
1835	29 11	22 0	30 0	30 3
1836	33 2	23 1	38 4	37 3
1837	30 4	23 1	38 7	37 5

The average price of British wheat, barley, and oats, during the *seven* years ending Christmas 1837.

	Wheat.	Barley.	Oats.
Per quarter,	52/6	31/6	21/10

In our previous review of the trade for the last six months of crop 1836, we took into calculation the serious effect the pressure on the monetary system had had on the currencies and character of the grain market; but now it may be remarked, that, not only during the crisis, and after the lapse of several months, since mercantile affairs have resumed their ordinary course, it is gratifying to have to state, that the *corn trade*, as a leading branch of commerce, has withstood the shock of all the jarring elements of pecuniary rupture, and, with the exception of a few minor failures, and even these chiefly connected with the seed trade, the credit of Mark Lane has emerged from the ordeal unscathed and unblemished.

After the expiration of the month of May, which partook partially of the ungenial character of the preceding portion of the season, the weather became most propitious, and vegetation was forced to its highest powers of progression. Indeed, we doubt if few parallel seasons can be recollected, when a more rapid change spread over the whole face of Nature than was witnessed at that time, as no combination of atmospherical phenomena could have proved more favourable for the vegetable kingdom. Nevertheless, the growth of the wheat plant at the time was not pressed beyond the nutritive powers it possessed of supporting its transitory stages, and did not therefore run beyond its strength. At the commencement of July, the wind veering to E. S. E., checked the advance of vegetation; and rain not having fallen since the 18th of the previous month, spring-corn and pulse were becoming sickly. Wheat, however, came into bloom under the most auspicious circumstances, the weather favouring the full development of the plant at this most critical period of its growth; and towards the middle of the month rain was experienced, succeeded by copious showers, and all nature seemed gratefully to acknowledge, by its invigorated growth and cheerful hues of green, this beneficent supply of moisture. The storms of wind, however, and heavy rains in some parts of the kingdom, especially Scotland, which occurred about the 28th and 29th of July, caused serious damage in the counties bordering the south-eastern coast, and the inland adjoining counties, which were then on the eve of harvest, twisting and breaking the lighter crops, and shedding the corn in those more advanced. The laid portion, however, sustained less injury than could have been anticipated, owing to the temperature proving favourable. The weather now set in warm, and forcing, and the *grain*, it is to be feared, was *set* too quickly in the ear in the earlier counties, as, notwithstanding the backwardness of the spring, the harvest in the environs of the metropolis commenced about the 14th of August, and in the southern districts about the same period. The weather remained fine and sunny for the first ten days, and so hastily was the wheat "got up," that in several instances farmers "carted up to the sickle;" and fields of "golden grain," which were seen waving in the morning's dew, had become bare stubbles by the setting sun. Some farmers have had cause since to repent this hasty mode of clearing the ground, and which has been instanced in the subsequent condition of their produce. During this interval of fine weather, the wheat to the south and west of London was nearly half secured, and about a third in the counties east of the Humber, after which, the vicissitudes of our clime were exemplified, and rain and sunshine succeeded each other, which more or less injured the outstanding grain, and has contributed to render the sample various in colour, quality, and condition, and differing in weight from fifty-six to sixty-four pounds per bushel. In Yorkshire, harvest commenced about the last week in August, and northward, two to three weeks later. The first sample of wheat appeared in Mark Lane on the 21st of August, being exactly one week later than the previous year. The samples continued to offer great disparity in quality, and which was evinced, by the price of the new growth varying from 42s. to 64s. and 65s. The grain, especially from Lincolnshire, Cambridgeshire, parts of Suffolk, and the lower parts of Essex, came to hand extremely rough, and many parcels unfit for immediate manufacture without kiln-drying; but from Kent, portions of Essex and Suffolk, and from Norfolk, we have continued to receive some fine samples of wheat, especially from Kent, which seems, the past season, to have been the most favoured county; and while the produce is inferior in quantity to the yield of the four previous years in the home counties, and on the eastern coast generally, yet it has returned better in parts of the southern, south-western, western, and northern divisions of the kingdom, than last season, and decidedly superior in quality, yet, taken as an aggregate, it is the worst crop we have had since 1832, and ranks only as a low moderate average of ordinary years. It is to be recollected, that, owing to the adverse autumn and spring, a great breadth of land adapted for the growth of wheat, the heavy and loamy soils, could not be sown, the very description of land which has the past year proved alone productive, the crops on the light soils having been generally thin, from the loss of plant during the previous winter, and the early part of the year; besides that, ultimately, the prematurity of the ripening deprived the kernel of part of its nutritious qualities, the grain in instances being deficient in its yield of meal, while the exposure of the ears to the rain added to the thickness of the skin, and hence another cause of diminishing the return to the miller.

The commencement of the present season, however, is likely to form a striking contrast with that of 1836–37, the grain having been got into the ground towards the close of the year under the most encouraging circumstances, and a very considerably extended breadth of land sown, induced by the fineness of the weather, and improved value of wheat. The early braird looked even and healthy; the only fears entertained were, that, from the mildness prevalent, the grub and worm would prove destructive enemies to the tender blades; but this solicitude was quieted by the frost, which, succeeded by heavy snow, has shielded the plant from the intense severity of the cold; and we may therefore look forward to the fields presenting, in due season, a cheerful aspect, covered with that deep rich hue of green indicative of the health and vigour of the plant, more particularly, as the rigour of the weather lately experienced is likely to free us, it is to be hoped, from the chilly nipping nights, which too often of late years have visited our island during the genial months of spring, and placed a severe and blighting check on the powers of vegetation.

As it is usual, in estimating the arrivals of corn, to calculate the supplies from harvest to harvest in each year, the subjoined arrivals of wheat are taken from October to October in each of the seven years received into the port of London.

WHEAT.

Years.	English.	Scotch.	Irish.	Totals.	Foreign.
	Qrs.	Qrs.	Qrs.	Qrs.	Qrs.
1831	191,298	9,204	7,827	208,329	700,183
1832	241,058	56,751	94,264	392,073	303,929
1833	349,411	10,904	27,766	388,081	71,051
1834	387,752	12,905	17,774	418,431	39,017
1835	403,721	9,814	4,803	418,338	12,410
1836	416,972	2,181	1,075	420,228	45,134
1837	342,615	521	856	344,092	181,415

The following are the respective arrivals from those counties on which the metropolis principally depends for its supplies of bread-stuffs.

WHEAT.

Years.	Essex.	Kent.	Suffolk.	Cambridgeshire.	Lincolnshire.	Totals.
	Qrs.	Qrs.	Qrs.	Qrs.	Qrs.	Qrs.
1831	63,177	37,787	32,321	2,318	7,791	183,394
1832	75,743	36,087	31,596	14,031	36,208	213,635
1833	137,204	70,190	46,796	24,561	15,270	294,021
1834	140,435	50,595	63,791	51,334	36,921	343,076
1835	139,660	69,215	65,858	54,991	29,790	359,514
1836	179,917	77,859	83,199	28,449	14,837	384,261
1837	156,071	62,567	51,785	32,998	11,160	314,581

FLOUR.

Years.	Essex.	Kent.	Suffolk.	Norfolk.	United Kingdom.	Foreign.
	Sacks.	Sacks.	Sacks.	Sacks.	Sacks.	Barrels.
1831	121,518	54,497	49,575	108,835	375,721	248,852
1832	95,167	41,826	33,526	103,782	483,757	58,528
1833	123,291	43,104	34,326	76,287	397,299	11,013
1834	118,307	36,185	61,286	99,502	408,439	33,813
1835	114,741	31,912	54,398	101,719	358,030	18,775
1836	150,315	33,010	72,177	124,551	428,481	51,167
1837	149,468	37,505	67,494	132,997	420,038	94,947

It will be observed that the arrivals coastways have been less the past year than during the previous four years; but in order to account for the decrease in the supplies, with an augmenting population, and prevent any calculation being taken of the consumption from the importations officially announced, it is to be noted that the bulk of the receipts are brought by land and inland water-carriage, of which no official register is kept, and that by the erection of steam-mills, and increased occupation of common mills in the neighbourhood, the deficiency is fully equallized, and which will be apparent when it is estimated that the population of London and suburbs must be now 1,589,000, allowing the same rate of increase as took place previous to the last census of 1831, and then calculating that each individual on the average consumes a sack of flour during the year.

As *barley* is later coming to maturity than wheat, it experienced all the changes of weather we have just referred to, and nearly the whole crop displays in the variety of its sample the injurious effects of being exposed to the inclemency of the season; discoloration was discoverable, of every shade, some quite black, while a few parcels were mow-burnt and sprouted. The plant was doubtless much injured by the prevailing drought of June, and its vegetative power being afterwards prematurely forced, it passed too rapidly through the intermediate stages of shooting and ripening, in consequence of which much of the grain is coarse skinned, thin, and irregular, and few samples, even of Chevalier, are found eqnal in brightness to the growth of the previous season. In quantity the yield has been only a moderate average, but from the increased breadth of land cultivated with this article, no doubt the produce was found commensurate with the demand, which it has been erroneously estimated, had materially diminished the past year. This conclusion, however, was founded on wrong data, the fact being, that the stock of old malt in the hands of the principal metropolitan brewers was much larger than had been anticipated, and though by the annual account of the consumption of malt in London and its environs for the last five years, it appears there is a falling off in 1837 of nearly 40,000 quarters, yet with the extra quantity of the previous year, the average amount of the two seasons will be nearly equallized,

	1833,	1834,	1835,	1836,	1837.
Malt	578,588 qrs.	662,713 qrs.	702,533 qrs.	754,313 qrs,	714,488 qrs.

Besides that the *taste of the age* on the part of lower and illiterate classes for more stimulating liquors, has caused a considerable increase in the consumption of the more deleterious article of spirits. While alluding to this subject, we insert a short account of the quantity of spirits paying duty in the united kingdom, together with the respective amount of population in the three kingdoms.

	England. Gallons.	Scotland. Gallons.	Ireland. Gallons.	Total. Gallons.
Total spirits of all kinds,	12,341,238	6,767,715	12,293,464	31,402,417
Population, ...	13,897,187	2,365,114	7,767,401	24,029,702
Amount of duty on British spirits,	L.2,968,378	L.1,103,467	L.1,428,745	L.5,500,589
Do. on foreign spirits,	2,816,406	94,056	33,448	2,943,911
Total duties,	L.5,784,784	L.1,197,523	L.1,462,193	L.8,444,500

Thus it appears that the quantity of spirit consumed in *England* is $\frac{7}{8}$ths of a pint per head on the population, in *Scotland* 2 gallons and 7 pints per head, and in *Ireland* 1 gallon and $\frac{5}{7}$ths per head; and if we take into the estimate the quantity of spirit distilled illicitly and smuggled, the consumption of the article in Scotland and Ireland would appear even still greater in proportion to that in England;* the only *set off* against the difference being the large proportionate consumption of beer and wine in England, compared with the other two kingdoms, as will be seen in the succeeding table.

By estimating that 1 quarter of grain distilled will produce 17 gallons of spirits, if made from malt only, and the like quantity to every 19 gallons where mixed grain is used, including barley, wheat, oats, and such proportion of malted grain as may be necessary, it would appear that the average annual consumption of grain for this purpose will amount the past year to about 1,350,000 quarters, having been in 1833—1,220,000 quarters, in 1834—1,238,000 quarters, and in 1835—1,294,000 quarters.

---

* The legitimate deduction from the premises we conceive to be, that these quantities of spirits are *distilled*, not *consumed*, in each country, in proportion to the relative numbers of the inhabitants; for the quantity of spirits exported from Scotland and Ireland to England, after payment of the duties, every year, is well known to be very considerable.—EDITOR.

In June and July, when the demand for barley was principally confined to grinding qualities, very low currencies prevailed, the London averages not exceeding 27/ to 29/ per quarter; on the 21st of August the first sample of *new* barley was exhibited, which was of Kentish growth, and sold at 35/, it was deficient in colour; and afterwards the selected parcels of Chevalier did not obtain more than 36/ to 38/, and inferior 32/ to 33/, distillers purchasing freely at 30/ to 32/; in October prices receded as the supplies increased, 37/ being a top quotation, and 30/for distilling sorts of 51 lbs.; as the month closed, and fine Chevalier was found to form so limited a proportion of the arrivals, it rallied in value, and was again held at 37/ to 38/, and samples of 54 lbs. to 55 lbs., equal to the growth of the previous season, would have commanded 40/, a few occasionally picked samples having attained these rates from the ale brewers, new malt having advanced to 62/ and 65/. In November liberal supplies of barley from Norfolk and Suffolk depressed the trade fully 2/ to 3/ per quarter on the better, and 3/ to 4/ on the intermediate qualities; during December an additional 1/ per quarter decline was experienced, and the year closed with Chevalier barley, varying in price from 30/ to 31/, bright 31/ to 32/, fine 33/ to 34/, extra 35/, a currency indicating the disparity in the quality; Norfolk and Suffolk malting being quoted at 29/ to 31/, which quality was taken by the distillers according to weight, who have been throughout the season ready purchasers of stout qualities; malt receded to 58/ and 60/, and these quotations have continued throughout January and February. The highest weekly average prices of barley for the kingdom was on the 13th of January 1837, when it arrived at 36/1, and the lowest on the 4th of August being 27/5.

The malt trade has remained languid throughout the season, and after attaining its maximum range of 62/ to 64/ and 65/, has generally receded to 58/ to 60/. The following are the number of bushels of malt consumed during the twelvemonths for the purpose of brewing in England, Scotland, and Ireland.

			Bushels.
2,099	licensed	brewers in England,	16,412,440
54,551	...	victuallers in ditto,	9,521,727
36,536	...	ditto, to sell on the premises,	3,702,417
4,118	...	ditto, not to sell on the premises,	218,616
242	...	brewers in Scotland,	988,800
17,026	...	victuallers in ditto,	140,380
945	...	brewers in Ireland,	1,829,587
		Bushels	32,813,967

The *oat* crop in England is becoming annually of minor importance compared with other qualities of grain, as London and the manufacturing districts are almost entirely dependent on Ireland, and the former partially on Scotland; and though the receipts at Mark-Lane from Lincolnshire, Cambridgeshire, and North of England, are still large, yet they form a small proportion of the aggregate imports. The past season, however, oats have proved in England the most inferior of the grain crops; the plant suffered in the spring from the frost, as well as the wire-worm and the want of moisture during midsummer, proved also injurious to its full maturity, the straw being short and heading thin; and when ready for the scythe, the rainy and unsettled weather was detrimental to the quality and condition. In Lincolnshire and Cambridgeshire, the counties where the greatest quantity of oats is grown, the crop was thin, especially in the wolds, and in no districts did it equal a full average; throughout the eastern counties the same remarks are applicable. To the south and west of London the returns have been more favourable, but still below an average; in some of the midland counties the crops varied little from the above, while in those more westerly situated the produce has proved better, and the quantity secured in good order was greater than more to the south, where scarcely one-half of the crop escaped from deterioration from the wet. In the northern counties of England, where there was an extended breadth sown, the bulk of the produce has been much less unsatisfactory, though the yield has not been equivalent to anticipation; the quality is lighter than in many former years, but though some samples are mixed with green corns, yet many are fine, and generally good coloured.

The following are the supplies of oats into London for the seven last years, and the foreign oats which have paid duty during the same period.

OATS.	1831:	1832.	1833.	1834.	1835.	1836.	1837.
	Qrs.	Qrs.	Qrs.	Qrs.	Qrs.	Qrs.	Qrs.
English, .	269,118	207,944	203,207	163,671	101,641	206,006	180,572
Scotch, .	144,631	117,883	176,979	326,402	217,049	169,239	79,676
Irish, .	332,099	681,957	573,349	488,822	721,494	616,560	705,586
Totals,	745,848	1,007,784	953,535	978,895	1,040,184	991,805	965,834
Quantity of foreign entered for home consumption.	266,713	131	671	46,771	125,575	45,612	189,199

By the above it will be seen that the falling of in the supply has been annually compensated for by the foreign stocks paying duty, the quantity of which the past year has amounted throughout the united kingdom to 333,610 quarters. During May and beginning of June speculation had been carried on in the foreign article, and large orders transmitted abroad, and from the exhaustion of the stocks in England, and little capability that Scotland possessed to meet our demand prices were expected to range high, as the trade was rendered totally dependent on Ireland, the resources of which, as usual, were as unknown and involved in as much uncertainty as if it were a foreign and hostile state, so difficult is it still to arrive at any statistical data of the growth and produce of that important grain-growing portion of the united kingdom. English feed oats were held at 24/ to 27/; polands and potato qualities, 29/ to 33/; Irish feed, 20/ to 23/; potato, 23/ to 27/; Scotch Angus, 25/ to 28/; potato, 27/ to 33/ and 34/. The finer qualities were extremely scarce and readily obtained the top range of price. The averages were eventually operated upon by these extreme prices, and the duties receded to 10/6 and then 9/3, at which the amount of foreign oats previously noted were entered for the consumption ; prices, however, owing to the foreign parcels pressing on the market rapidly declined, and at the end of July the top quotations were reduced 3s. per quarter, and the lower 2/, the highest weekly average of the kingdom having been 25/6. The supplies from Ireland, which kept pace with the demand, prevented any rallying of the trade before the new crops came to market, and though prices remained steady, yet business was deprived of any stimulus, as the new crop in Ireland was most favourably reported. The averages which had ranged at about 24/ now gradually declined, until on the 29th of December they receded as low as 20/2 for England and Wales, English feed not being worth more than 17/ to 22/; Irish, 19/ to 20/; Scotch Angus, 21/ to 24/; English potato, 23/ to 28/; Irish, do. 23/ to 24/; Scotch, do. 23/ to 29/.

Sales proceeded slowly towards the close of the year, and it was calculated dealers and consumers were in limited stock, carrying on their consumption from "hand to mouth," and awanting the increased supplies likely to be received on the turn of the *New Year*. Frost soon set in, and the navigation of rivers and canals becoming impeded by the high prices were anticipated from the imagined lowness of the stocks on hand, it being known that in granary the stores were small. Week, however, succeeded week, and though during January and the first week in February the total supplies from England, Scotland, and Ireland did not exceed 29,200 quarters, yet no demand was experienced, and except a few retail sales at 6d. to 1/ advance, according to the necessity of the purchaser, no enhancement was noted on the general currencies; and thus a weekly consumption computed at 20,000 quarters, was for more than *five weeks* met by less than 30,000 quarters, though it would have been calculated that 100,000 quarters would hardly have suffered, considering the increased consumption produced by cold weather; thus another striking instance is afforded of the futility of attempting to predict the progress of the grain trade, and ought to act as a fresh example of warning to sanguine speculators, shewing in vivid colours the hopelessness of their attempting to define any limits to a trade possessing the *Proteus*-like character of that of grain.

Beans are estimated a full average crop and good in quality, though the condition has been much affected by the weather. *Pease* have proved abundant though the samples of white qualities are uneven, and a large portion much deteriorated by the worm; grey and maple generally good. *Tares* have also yielded plentifully, and a larger breadth than usual was left for seed. *Potatoes* abundant in the northern counties, as well as the southern and western, a fact that should not escape the serious attention of the speculator who anticipates vesting his capital in foreign wheat, as with a large return of this invaluable root, and perhaps one of the most productive seasons of pulse and vegetables, which we have been blessed with for some time, it is extremely hazardous to form any minute calculation how far these different esculents which act as substitutes for meal may diminish the demand for corn, should prices advance to a point which will force the lower orders to resort to coarser descriptions of food.

In *Scotland* the wet unfavourable weather experienced for the autumnal sowing of wheat forced many farmers either to refrain from planting during the current season, or to postpone getting the seed into the ground until spring, when the same atmospherical causes proved adverse to their effecting their purpose: thus the aggregate breadth of land cultivated with wheat has been considerably below an average; indeed, in some districts, little more than half the usual quantity has been planted. The autumn and winter sown wheats came up generally very irregularly, were thin on the ground, and suffered from the depredations of the wheat-fly. On the richer soils, a good deal was laid by the heavy rains which fell towards the end of July and commencement of August. In the counties on the borders of the Forth, and one or two of the counties immediately adjoining, which comprehend the chief districts of Scotland for the growth of wheat, the weather proved highly favourable for the securing of the crops, but the quantity here, and in most other divisions of the kingdom, has, on thrashing out, proved unsatisfactory, as well indeed as of barley and partially of oats, which is attributable to the forcing weather during July, which induced a prematurity of growth, and the plant ran too much to straw, rendering it less capable of withstanding the heavy rains and wind. In the Lothians, with a soil inferior to none in Scotland in fertility and cultivation, it has been estimated that the average yield will not exceed four quarters to the acre; on the sheltered shores of the Moray Firth, comprising the lower portions of Moray, Nairn, Inverness, and Easter Ross, which comprise the districts in the more northerly part of Scotland where wheat is cultivated, the crop was thin but secured in excellent condition, and it turns out rather less than an average in quantity, but as to quality some remarkably fine samples are to be met with. It appears, therefore, that notwithstanding the bulk and apparent abundance of the crops generally on their first gathering, as the farmer has advanced in thrashing the grain from the straw, disappointment seems to have followed his exertions and the discovery that there is a greater deficiency in the yield and a less proportion of fine quality than had been anticipated; and it is on the retentive soils and those subjected to the highest cultivation, that the acreable produce has yielded the most unsatisfactory return. Wheat has produced various shades of quality, some examples particularly fine, but the larger proportion coarse and unequal; the weight varying from 56 lbs. when much out of condition, to 58 lbs., and from that to 62 lbs. and to 64 lbs.; prices of wheat have ranged high, say from 34/ to 60/ for red, and 35/ to 66/ for white.

The quantity of barley sown has been considerably larger than usual, much of the land intended for wheat having been planted with this article. The produce, considering the extended breadth, is below an average, yielding less per acre than expected, and on the whole will not exceed a full average of the last few years, in which, however, there has been a gradual increase of growth. Much of the crop is coarse and dark in colour, and offering nearly as great disparity in the sample as wheat; while some is superior to the general run of years. The weight varies from 49 lb. to

55 lb. and some few parcels 56 lb.; but the greater proportion is found under 53 lb. per bushel. The crop of bere in the northern counties is in many instances thin and deteriorated in sample by the weather. The breadth sown was larger than customary, owing to the retarded period that it was expected the oat harvest would have been gathered, as this crop ripens earlier than oats, the staple commodity of this division of the kingdom. The local demand for barley has continued steady for malting purposes; but the stoppage of several of the principal distilleries from working, who were engaged in manufacturing spirits for the London rectifiers, has caused the secondary and inferior qualities to become a complete drug on the markets, even at very depressed currencies, and which must eventually be thrown upon the London markets, as great doubts are entertained if the Government will be induced to make any alteration in the present code of Excise Laws, that the influential body of London distillers may deem detrimental to their interests. The quotations of barley have ranged from 20/ to 28/ to 33/, and extra Chevalier 34/ to 35/ per quarter.

Oats have not been cultivated to their full extent; the lateness and inclemency of the spring having impeded the completion of sowing, besides that bere, from its earlier ripening, in some instances superseded the growth of oats. Farmers, in those districts, such as Aberdeen, Banff, and Kincardine, where the greatest quantity are produced, were extremely cautious in the selection of their seed, using only the earliest and hardiest sorts; the early *Angus* and *Sandy* oats were those chiefly selected; the latter is a variety whose adoption in England would doubtless be attended with an advantageous result, the plant is extremely hardy, grinds profitably, and the straw capable of defying the storm. The weather proved auspicious during the harvesting, and the crops though not abundant, is a fair average, and of good quality, and the sample, excepting the green ones, of good colour. In the southern and western portion, the quality on the earlier soils is generally good and little deteriorated by the weather, but on the later soils the grain ripened unequally, and the sample presents a disparity of quality; the quantity being below an average. On the shores of the Moray Firth, the yield has been good in quantity and quality, but short in straw. On the aggregate, however, complaints are made that the new crop on being ground does not return an average quantity of meal, compared with the latter season. As to general quality, some very beautiful samples are shewn, but the general runs are only middling, and a proportion very inferior. The weight of the potato and Hopetoun range from 40 lb. to 43 lb., and of common from 37 lb. to 42 lb.; a few selected parcels of potato weigh 44 lb. to 45 lb. per bushel.

In the Highlands, where so much misery and distress were experienced the previous year, the intensity and the suffering having, however, been partially mitigated by that benevolent spirit which in the United Kingdom is never appealed to in vain, confident hopes are entertained that, owing to a supply of good seed, the produce will prove sufficient to meet the local necessities.

In perusing some of the agricultural reports from the United States, we have been forcibly struck with the similarity of characteristics which prevail when compared with those from *Ireland*, not varying at intervals in a few shades of difference, but opposed to each other in the widest extremes of good and bad; such a disparity in the lapse of a few weeks it is difficult to reconcile, whether the descriptions proceed from too vivid an imagination—too sanguine a temperament—or a predilection for romance, we are at a loss to divine, knowing only that it is a constant source of regret to the English trade that so little certainty annually prevails in the accounts from Ireland, as to the produce and stocks of grain; a country which is becoming the *granary* of England—a country whose surface is computed at 19,400,000 acres, of which only 12,100,000 are cultivated, leaving a proportion of more than one-third at present unprofitable; but which, under truly liberal and enlightened policy and enterprise, free from the dictation of factious and party principles, might be rendered subservient to the amelioration and aggrandisement not only of the island so richly endowed by the hand of nature, but add materially to the resources and power of England.

In estimating the wheat crops, we are led to believe that taking a line northwards from the capital, along the coast, and traversing the counties of Meath and Louth, there has been a failure in the produce to a material extent, as compared with the crop of 1836, computed even as much as one-fourth; though it should be considered that the harvest of the previous year was very abundant in those districts; in the county of Cork, and part of that of Waterford, the yield is also below an average; while in the counties of Clare, Limerick, Galway, and Tipperary, the growth has been unusually productive; in the other divisions of the island, the acreable produce is a moderate average, the quality generally good and sound, and very superior in these respects to the crops of 1836, which, from its inferiority, required the import of fully 50,000 quarters from England to work up the new grain; millers being obliged to use a large admixture of old corn to render it available; but this season similar complaints are not made by the manufacturers, and old corn can be nearly dispensed with. On the whole, it appears that the growth will meet all the local demands, leaving a considerable surplus for export, and which is already exhibited by the increased shipments of flour to Liverpool, the west of England, and to Wales, compared with the same period last year. The extreme range of wheat has been 20/ to 30/ for red, and 24/ to 32/6 for white per barrel.

The barley crop is reckoned rather to exceed an average produce; but various in quality in the northern and eastern districts, much of the produce proving light and thin. The growth of the Chevalier is fast increasing, and is maintaining its superiority of quality. The quantity of malting and distillery parcels have been equal to the increased demand, prices varying from 10/ to 13/, and fine 14/ and 15/ per barrel.

Oats, whose cultivation is annually augmenting, have yielded a full average return, and superior in quality to the growth of ordinary seasons, the crops being secured in unusually good condition; and the chance to the farmer of a dry fine harvest like the last, in comparison with a humid state of atmosphere, usually experienced, confers upon him a considerable advantage, as his produce undergoes much less deterioration from kiln-drying.

From the south of Ireland, the quality of the sample is the least favourabl reported. The quotations have been as high as 11/6 to 12/6 per barrel, fre on board, and are now 10/ to 11/ according to the place of shipment, and to 9/3 for Galways.

As illustrative of the unceasing capabilities of Ireland to supply Grea Britain with grain and flour, and the magnitude of these resources, we ar nex the following imports into Great Britain from the sister kingdom during the last *seven* years:—

Years.	Wheat.	Barley.	Oats.	Flour.	Oatmeal.
	Qrs.	Qrs.	Qrs.	Cwt.	Cwt.
1831	407,714	185,642	1,286,254	524,318	581,371
1832	552,740	123,097	1,662,786	831,434	611,412
1833	541,475	101,767	1,353,533	1,059,587	642,692
1834	462,229	217,854	1,277,598	1,110,463	772,994
1835	340,535	156,176	1,462,581	1,124,343	566,006
1836	249,360	178,341	1,627,324	1,169,200	675,470
1837	252,000	187,000	1,634,000	983,000	1,004,000

From the detailed facts which have been given, it would appear, that th crop of wheat, compared with the four last seasons, has been considerabl below an average produce, and can be only ranked as a low moderat growth of ordinary years, with less land sown than usual; that, in Scotland, the acreable produce is deficient even on the diminished breadth cultivated, but that in Ireland the harvest has exceeded a common growth i quantity, with a superiority of quality, and that there will be a surplu supply beyond the usual exports to Liverpool and our western coast; tl old wheat has experienced a considerable draft on its quantity, owing t the inferiority of the new English wheats, which required a larger portionate admixture than usual to render them available to the mil and this demand has been extensive, notwithstanding the amount of ar a quarter of million quarters of foreign wheat which paid duty; and as the old wheat in granary and stock throughout the kingdom is bei wound up within a comparatively narrow compass, prices, the ensuin season, will be more than ever dependent on the appearances of the field and consequently liable to more than customary fluctuation from the stat of the weather. Judging from these circumstances, there does not seen much reason to anticipate any material decline in the value of the stapl commodity; while, on the other hand, in reference to any material advance it is to be remembered, that the year's produce, including grain, pulse, fruit and vegetable, in fact the whole mass of *vegetable esculents* for man and animal, is one of the largest that we have been blessed with for some years and the abundant growth of the chief substitute for bread, potatoes, an their superior quality will decidedly diminish the consumption of th coarser meals; besides, that Ireland last year not only exported a decrease quantity, but in many places received supplies from England, and the demand for meal in the Irish home markets was greater than usual, whicl will in a great measure be counteracted this year by the consumption o potatoes. It leads, therefore, to the belief, that unless the forthcoming crops should be subjected to very unfavourable weather, with an unpromising aspect of future produce, the aggregate averages of wheat are not likely much to exceed their present range of 53/; but with a late harvest, higher rates may prevail for a few weeks just preceding the securing of the new growth, though not of sufficient duration to leave any profitable margin for foreign speculators.

By the agricultural returns from *Russia*, we find that the empire, though fertile throughout the greatest portion of its immense territory, and which is generally abundant in corn, was doomed in 1834 to suffer great privation from the effects of the previous bad harvests, and was found to import corn, principally rye, which is the staple commodity. The crop of 1835, though sufficient for the consumption of the country, was not considered productive; but, in 1836, the harvest was excellent, and the exportation of corn resumed its wonted activity. It has not been yet ascertained how much grain was sown in 1836, nevertheless some idea may be formed of the actual state and importance of agriculture in Russia from the quantity sown in 1835. From the accounts of the local authorities, whose testimony is to be depended on, there were sown in the autumn 20,549,149 tschetverts of wheat and rye, or about 14,076,129 qrs. The quantity of March corn, as barley, oats, &c., amounted to 30,398,046 tschets, or 20,820,579 qrs., making the total of 1835 nearly 35,000,000 qrs. The expectations, however, of an abundant harvest this year, have been disappointed in several portions of the empire, owing to the summer having been cold and humid; but in the governments of Bessarabia, Crimea, Kieu, Pultawa, Cherzon, &c. the crops have been productive. This year, the free import of rye from Gallicia has been permitted, which indicates that the local failure of this staple commodity has been considerable. Prices of wheat have been, at *Riga*, per qr., Courland wheat, 25/5 to 28/3; oats, 9/10; linseed, 32/ to 34/5. At *Archangel*, the shipment of oats have been made at from 10/11 to 12/3 per qr.; linseed was early contracted for at 35/1 to 36/5, and afterwards receded to 28/5, to 29/ for good qualities; wheat nominally 26/.

From *Konigsberg*, we are informed that the wheat crop has proved scarcely an average, being in many localities extremely defective, but the quality finer than in 1836, few growths of later years yielding a better sample; the stock of old wheats on hand at the commencement of this year was about 170,000 qrs., of which, a large proportion was lying in granary on British account. Rye has been very deficient, so much so, that supplies have been already sought for at the port for the interior distilleries, as the potatoes having *missed*, and being of inferior quality, contain a very diminished quantity of alcohol; the stock of old rye not exceeding 26,000 qrs. The produce of winter and summer barley has been satisfactory in quantity, but the quality light, the former weighing only 49 lb. to 50 lb., and the latter 48 lb. to 49 lb. Oats good in quality, but a short growth, the stock of old being about 70,000 qrs. Linseed, contrary to expectation, has turned out very deficient, and the accounts from Poland intimate a falling off in the yield; the stock is trifling, not exceeding 19,000 qrs.; fine linseed is scarce, and good sowing likely to be dear in spring. The exports of wheat have been during the year 50,000 qrs.; barley, 35,000; rye, 100,000; oats, 36,000; linseed, 31,000 qrs. Wheat, at the last quotations, varied from 23/ to 35/; barley, 13/ to 16/; oats, 9/6 to 12/; crushing linseed, 26/ to 31/.

From *Danzig*, it appears that the new crop of wheat in the neighbourhood, as well as *Poland*, presents a good sample as to colour, and sound in quality, but generally defective in weight; from Volhynia, the quality is the finest; but the receipt of these wheats depend on the state of navigation of the river Bug, which in some seasons is so deficient in water, that the craft are prevented reaching the Vistula; besides, the produce is reckoned one-third less than last year, and much of the crop will therefore be required for the consumption, owing to the serious failure in the growth of rye; in other parts of Poland the harvest has been below an average, and complaints are being already made, that on thrashing out, the yield falls far short of the expectation when the grain was housed; and a corroborative instance of the truth of these statements of deficiency, is afforded in the want of samples at Danzig in winter, and what are usually freely offered for spring shipment. The prices are higher than in 1833, and there appears some cause for the enhancement, when it is considered that the last crop has not been plentiful in any of the European states; that America is believed still to require supplies; and the stocks at all the large foreign shipping ports materially reduced, particularly in Holland and France. The present stock of wheat at Danzig, the wheat depot of the Baltic, amounts to about 400,000 qrs., of which it is estimated about 80,000 qrs. belong to British speculators, about 120,000 qrs. to local merchants, and 200,000 to Polish importers. The exports have amounted during 1837 to 318,300 qrs., of which 240,000 qrs. were destined for Great Britain, and 32,000 qrs. for Guernsey and Jersey. White wheat is quoted at 33/ to 37/; high mixed, 30/ to 33/; mixed, 27/ to 29/; red, 25/ to 26/. Owing to the restrictive laws in England, and the high prices of the home produce preventing its being ground into flour for export to our own Colonies and the South American States, these markets are entirely supplied with foreign flour, English merchants importing the article from Danzig, Copenhagen, Hamburgh, &c., and re-exporting it to their colonial brethren; the foreign market, therefore, in flour is rapidly on the increase, and extensive mills are being erected on the most approved principles. At Danzig, Mr Witt, who is the principal miller, has the power of delivering 100,000 barrels per annum, and the celebrity of his brand has caused a large influx of orders. Last year the export to this country was 62,000 barrels, and orders were on hand for 30,000 barrels for spring shipment, at from 17/6 to 19/ per barrel of 196 lb. At Warsaw, steam-mills are erected, and a very superior quality of flour produced; but the Prussian Government, in order to protect the native millers, having levied a duty of 3/ per barrel on the transit of the article through the Prussian territories to the sea, this impost acts almost as a prohibition to its export, unless the prices should chance to allow the foreign speculator to pay 22/ per barrel. Rye has experienced a material improvement in value during the season; on its first arrival from the interior it was difficult to place at 15/ per qr., and even 14/ was accepted; on its being ascertained after harvest that the crops had proved very deficient, the quotations gradually advanced, and which the failure in the potato crop has contributed still farther to enhance in the interior. In Warsaw, and all the country markets in Poland on the banks of the Vistula, 24/ to 27/ per qr. is being paid, the yield on many farms not having been sufficient for seed; at Danzig prices are now 22/, and likely to rise to 24/ per qr. Nearly 27,000 qrs. of pease have been sold during the season; prices declined from 24/ to 16/, and advanced after harvest to 18/6 and 19/. The quality of the new white and yellow pease is excellent, but the crop short, and, owing to the want of rye, are obtaining high relative prices inland. The new linseed from Gallicia proves very fine, and the Polish generally good, but the yield has been deficient compared with 1836, and the supplies from the nearer districts of Poland will require a careful screening; prices for spring shipment are about 31/ to 32/ per qr.; the exports having been about 20,000 qrs., and the stock in granary 3000 qrs.

In *Mecklenburg*, wheat, barley, and oats have proved much less productive than the year 1836, though that year was not even accounted abundant; pease, however, form an exception, and are plentiful. Wheat is only an ordinary average crop, tolerably good in colour, but of much disparity in quality and condition, part being soft and ill-conditioned; not that the weather was unfavourable for harvesting it, but the farmers were over anxious, and housed it too soon. Several samples also exhibit blight. The weight varies from 58 lb. to 62 lb. Rye has been a short crop, and handles dry, but the grain thin, and weighs about 57 lb. Barley, on many lands, has returned a good crop, and generally in good condition, part fine and bright, and weighing 50 lb. to 52 lb. Oats are deficient, but good in colour and quality, weighing 35 lb. to 36 lb. Pease generally fine and hard. Owing to the American demand for wheat, and limited supplies from the country, prices, towards the close of the year, advanced 3/ to 4/ per quarter; but farmers having thrashed out more freely, quotations have receded. Rye has met a free sale, and barley has also moved off readily; oats being only taken by the consumers. Wheat is quoted at 22/ to 27/, extra 28/; rye, 18/ to 20/; barley, 14/ to 15/; oats, 10/ to 12/; pease, 16/ to 19/, free on board in spring. The stocks of old wheat at Rostock were estimated at 26,000 qrs. on the 1st of January, and about 20,000 qrs. at Wismar.

Both in the Danish Islands, and Duchies belonging to the kingdom of *Denmark*, wheat has disappointed the expectations of the farmers as to quantity, but the colour, together with the quality, has proved tolerably satisfactory, the weight being estimated at 60 lb. to 62 lb.; and, exclusive of the consumption, there may be 250,000 barrels, or 119,050 qrs. exportable. Rye has been secured favourably, is dry in condition, and heavy, say from 57 lb. to 59 lb., and the sample good; but the produce is less in proportion than that of wheat, and will barely suffice the local demand, and it is thought that supplies will be needed for some of the Baltic ports. The yield of barley may be reckoned nearly an average, the condition good, and quality kindly for malting purposes, and weighing 52 lb. to 53 lb.; but the wet experienced during the period of housing has been injurious to the colour of the samples. In *Norway* and *Sweden*, the article has failed, and a demand, therefore, is likely to ensue for it from the Danish districts. Oats are the best crop, and it is calculated that the kingdom will be enabled to meet a foreign demand to the extent of 300,000 barrels, or about 142,860 qrs.; the weight varies from 36 lb. to 38 lb., and the colour good. Pease and tares have returned a better produce, both as to amount and quality, than in 1836. Taking into calculation the breadth sown with rape seed, the yield is short, though still much more has been thrashed out than in 1834 or 1835; the sample bold, dry, and profitable to the crusher. Wheat for spring shipment was quoted at 26/ to 27/; barley, 16/ to 17/; oats 10/ to 12/; pease, 20/ to 21/ per qr. free on board at Copenhagen.

In the upper districts of the river Elbe, from whence *Hamburgh* draws its main resources of grain, we find that the wheat crop has proved below an average produce; and into *Saxony* and *Bohemia*, supplies are being directed from the Saale and Magdeburg districts, instead of grain, as in previous years, being received from thence. In *Holstein* and *Pomerania*, the quality, as well as produce on thrashing out, fall short of the anticipations. Though the colour is good, the weight, on the whole, is deficient, and varies from 56 lb. to 62 lb., the heaviest parcels requiring time and care to select, and only at higher prices; the condition, however, is dry, and, with the hard winter which has been experienced, best runs may be brought to weigh 60 lb. to 61 lb. The limited amount in granary of wheat, and the brisk demand which has been sustained from the United States, in addition to a constant sale to millers, who have entered into large contracts for delivery of flour to export, have enabled holders to continue realizing high prices for fine parcels.

In the *Lower Baltic* ports, as the demand for France appears to have abated for the present, and additional purchases not likely to be made for America, until the extent of its wants are ascertained towards spring, and freights become moderate, we might have purchased at 26/ to 27/, best runs of 60 lb. to 61 lb. free on board in spring; and for upland wheats, deliverable here, 1/ to 2/ per quarter more must be allowed,—a difference of price which is saved to the shipper by the lower range of freights, and greater facility of shipment. Rye yields much under an average, but the quality is superior and heavy. The low wheats approaching this grain in value, will no doubt be much used as a substitute, otherwise foreign supplies would be needed. The return of barley is an average one, but lighter, and inferior to former crops. Upland barley will not be readily obtained of even 50 lb.; but Mecklenburg, Danish, and Holstein is procurable, weighing 51 lb. to 53 lb. at prices equal to 14/ and 15/ per quarter, according to quality and ports of delivery. Oats are below an average growth, and the quality and condition not generally satisfactory, though fine parcels can be selected. The stock of old was nearly exhausted, and the consumption at an early period had to depend on the new crop; unless any demand spring up, purchases for early shipment may be made at 10/ to 12/ per quarter.

In *Holland*, the wheat crop has yielded below an average, and the same complaint is made in the districts bordering the Rhine, from whence considerable supplies are received at Rotterdam, and which have formed the principal part of the large exports made to America the past year. Prices have latterly ranged from 32/ to 33/ per quarter. The stock of old wheat at Amsterdam and Rotterdam is much reduced, and imports are likely to be made during the season from the Upper Baltic ports. Summer grain and pulse have proved a moderately fair growth.

In *France*, much contrariety of opinion has prevailed respecting the crops, as many farmers, in forming an analogy with the superabundant harvest of 1836, have not only misled themselves, but others who were anxious to arrive at the statistical fact of the aggregate produce. The crop, however, does not exceed a moderate average of ordinary years, but the sample finer and much sounder than the previous yield, which has been infected by weevil to a considerable extent; and, therefore, though the stocks of old wheat are large, millers are ready buyers of sweet sound samples. Rye has proved deficient, and under an average growth. Oats suffered much from the weather, and were expected, in the northern and north-western departments, where they are chiefly grown, to turn out very deficient; but a seasonable supply of moisture, succeeded by a favourable state of atmosphere, have brought them round, and the crop is a moderate average. The average price of wheat throughout the kingdom has fluctuated from 17 francs 3 and 10 cents to 17 francs 92 cents per hectolitre, or from about 38/9 to about 40/10 per quarter; and, with the exception of 1836, has maintained the highest range since 1832 by 2 to 3 francs per hectolitre, or from about 4/4 to 6/6 per quarter. The crops of mangel wurzel, or, as it is termed in France, *Beet-root*, has been very productive, which, considering its extensive cultivation, and the number of sugar manufactories dependent on its growth, has been fortunate for the farmers. In order to convey an idea of the extent of its increasing culture, it may be stated, that, in 1835, there was extracted from these roots 30,349,340 kilogrammes, or about 28,822 tons of sugar, and in 1836, 48,968,805 kilogrammes, or 48,094 tons, allowing 20 kilogrammes weight of root to yield one kilogramme of sugar.

The revival of the demand for wheat in the *United States* soon after the harvest, and the crops, with the exception of a few sections of certain States, being generally reported abundant, affords grounds for doubting the continuance of the high range of prices which the article has again attained: and as the attention of speculators, both at home and abroad, has been attracted by the profits which shipments at the current quotations would have returned, it has therefore been matter of surprise the cause of the markets assuming this anomalous character; and that, at so early a period of the season, the Americans should be apparently in need of foreign bread stuffs; wheats having been noted at 1 dollar 80 cents to 2 dollars per bushel; flour, 9 dollars to 10 dollars per bushel, with limited stocks at all the principal shipping ports, and an extensive demand, especially from *New England*. The supplies by the Hudson river seem alone to have come liberally forward, having been inconsiderable from all other districts. The middle States, which have been accustomed to furnish a large surplus of flour, have scarcely remitted to the ports as much of their qualities as they are wont to take back of other brands. At Baltimore, where the flour mart is deemed the largest in the Union, the weekly inspections have not exceeded those daily made at New York. In endeavouring, therefore, plausibly to account for these disparities, it is necessary to remark, that the crops of wheat on the Atlantic coast are represented as having again proved deficient, but abundant, west of the mountains, which comprise the principal wheat-growing States, and that the season has been dry, and the mills and navigation impeded from the want of water. Besides, the American farmers not being forced from pecuniary necessities to hasten their produce into market, are unwilling to part with their wheat, unless they can realize as much money for it on the instant as they "calculate" themselves likely to obtain at a more advanced period of the year; resolved, in fact, not to sell the raw material of meal with the chance of being compelled to repurchase it at higher rates. The country, also, having been completely bare of grain when the new crops were housed, it required an immense quantity to supply the smaller deposites usually occupying a portion of every inland granary, but which had become entirely exhausted before harvest. These circumstances combined, have had a more powerful influence on the markets than had been expected, as, with the exception of wool, all articles of agricultural produce are maintaining a full range of price. There seemed, however, little doubt that, when the spring navigation reopened, the arrivals by river and canal would deprive the trade of all chance of supporting a range of price equal in effect as if a dearth prevailed, and not that the scarcity was created by artificial and incidental circumstances, and which can be readily obviated by any co-operation of the growers; therefore it is, that, while it may have been politic for the nearer European ports, on the spur of the moment, to have shipped wheat in autumn to the United States, it would have been much the reverse to speculate on spring shipments, especially from the Baltic. It may be also observed, that strong evidence has been adduced in the case of America, that no scarcity of money, or extent of commercial misfortune and embarrassment, can counteract the tendency to high prices in all the necessaries of life, when supply falls short of demand; and we fully concur with an American writer, who states, that though the affairs of many individuals may remain embarrassed, yet the affairs of the country are likely soon to be adjusted, which, when arranged, it will be found that the resources of America, its facilities, and its stimulants to enterprise, will develope themselves with renewed energy, and more conspicuously than they have ever done before.

The Americans, also, a people ever alive to their own welfare, are beginning to perceive that, by the surplus growth of one article to the partial exclusion of another, great inconvenience may arise to the internal machinery of the States; and, therefore, the planters in the luxuriant and extensive State of the Mississippi, are appropriating a portion of their rich lands to the cultivation of *wheat*; and as early as the middle of last June, several fine crops of that staple article of food had been secured in one of the more forward counties, and the produce the past season of wheat and maize will prove fully equivalent to the local consumption; whereas, in former years, by turning the attention almost exclusively to the growth of *cotton*, the planters were forced to procure the chief supplies of grain from other quarters. By thus devoting part of their lands and labour to the tillage of grain, the crops of cotton will be necessarily curtailed, which will so far act beneficially, inasmuch as the natives will have a supply of food without purchasing it at exorbitant rates; the average value of flour having, during 1837, been fully double the amount realized in 1825, at a time likewise when their pecuniary resources were limited: while, on the other hand, the cotton market not having so large a surplus stock, that article is likely to obtain a more remunerating price. As long as the Americans confine their agricultural operations to alluvial and maiden soils, or lands of the first degree of fertility, it will enable them, as from the effects of superior machinery, to derive a higher average rate of profit compared with the old settled countries of Europe; and consequently, without any internal prejudice, to afford a higher rate of interest on borrowed capital. By these means, a drain would be made on the surplus capital of Europe, which would increase in proportion to the facility of communication, and the good faith which the Americans may preserve in payment of the interest. Nothing can weaken, or rather counteract, such an absorption of capital from this country, but an amelioration in the laws which impose duties on the importation of articles of subsisting comfort, and which relaxation would increase the profit on the manufactured production, and bring us nearer to a par with the agricultural machinery of the United States.

QUARTERLY AGRICULTURAL REPORT.

May 1838.

The severity of the storm continued for two months, until near the middle of March. The snow, deep as it was in many places, then melted gradually away, unaccompanied with heavy dashes of rain. The tendency to frost, however, continued in the atmosphere, and may still be said to continue to this day (22d May), though May has unlocked the portals of spring, which she never even attempted in the last wintry season. What with the gradual disappearance of the snow, and the prevalence of a frosty influence, the land has presented a drier and mellower bed for the seed than we remember for many years. The wheat generally looks sickly, and where the snow lay thickly on an early sown braird, the plants are mostly rotted out, and the land has been ploughed up for oats. The later sown wheat has not been so affected. The sown grasses, though thickly enough planted, are late; and, contrary to usual experience, the permanent pastures have this season taken the start of them in verdure. The rents of grass parks are below the marks of last year, though yet abundantly high. The Swedish turnips have withstood the winter well. Stock have improved in condition since the storm; their market prices are pretty fair per stone, but the storm having much retarded the increase of stones, this is not thought a good paying year to the feeder. There has been a fine fall of lambs in the low country. The hill stock has suffered very severely for want of food, and the loss among the ewes and lambs in consequence it is apprehended, will be severe. It is yet premature to speak of the probable price of wool at clipping time next month. It is admitted that the stock of wool on hand is not heavy, yet, unless a start revive in the American markets for our woollen manufactures, there is little probability of the prices exceeding those of last year.

TABLES OF PRICES, &c.

The Average Prices of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets:—

LONDON.

Date.	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans.	
1838.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Feb. 2.	56	6	31	3	21	11	29	2	32	6	32	7
9.	56	10	30	8	21	10	28	9	32	2	31	6
16.	58	1	30	5	22	1	29	6	32	4	33	11
23.	57	1	29	9	22	3	29	4	32	10	31	2
Mar. 2.	57	2	30	3	22	1	30	2	33	2	32	1
9.	56	10	29	3	21	9	29	6	33	6	31	4
16.	57	4	31	1	22	3	30	4	32	10	31	8
23.	59	2	30	3	22	5	31	6	32	4	31	9
30.	59	6	30	10	22	1	30	8	33	6	31	10
April 6.	59	0	30	3	21	10	32	2	33	8	32	7
13.	60	6	31	3	22	11	33	0	32	10	33	8
20.	59	11	31	3	23	2	32	6	33	6	33	2
27.	58	11	31	7	22	10	31	8	33	2	32	7

DUBLIN.

Date.	Wheat Per Bar. 20 St.		Barley Per Bar. 16 St.		Bear Per Bar. 17 St.		Oats Per Bar. 14 St.		Flour Per Bar. 9 St.	
1838.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Feb. 2.	30	0	14	11	11	6	10	10	18	6
9.	30	7	14	7	11	2	10	1	18	4
16.	31	1	14	0	11	0	9	11	18	2
23.	30	7	14	2	11	4	10	2	18	4
Mar. 2.	31	9	14	6	12	2	11	5	18	9
9.	33	0	14	4	12	6	11	3	18	6½
16.	33	4	15	8	14	8	11	4	18	10
23.	35	10	16	6	14	6	11	2	19	0
30.	36	6	17	3	15	6	11	6	19	3
April 6.	37	0	17	7	16	0	11	3	19	5
13.	36	0	17	8	15	4	11	10	19	9
20.	35	0	17	10	15	6	11	10	19	6
27.	36	1	17	6	15	2	11	10	19	10

LIVERPOOL.

Date.	Wheat.		Barley.		Oats.		Rye.		Pease.		Beans.	
1838.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Feb. 2.	54	8	31	6	20	3	28	6	32	8	36	10
9.	55	2	28	1	20	6	29	2	32	4	36	4
16.	54	3	28	3	20	0	29	6	32	6	36	1
23.	53	5	31	0	19	5	28	8	32	10	37	10
Mar. 2.	54	10	33	10	19	6	28	6	32	3	39	8
9.	55	6	32	4	20	5	29	4	33	4	38	2
16.	56	8	30	0	21	2	29	10	33	2	37	0
23.	57	7	27	5	21	0	30	6	32	10	37	5
30.	57	0	28	10	21	3	31	2	32	6	37	10
April 6.	60	4	28	9	21	6	31	6	33	2	38	10
13.	60	3	29	8	22	8	31	4	32	8	40	2
20.	59	10	29	0	21	8	31	6	32	6	39	7
27.	59	9	29	8	21	9	31	10	32	9	39	0

EDINBURGH.

Date.	Wheat.		Barley.		Oats.		Pease.		Beans.	
1838.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 31.	60	4	29	0	23	1	33	6	34	0
Feb. 7.	59	8	30	2	23	0	33	6	34	0
14.	58	9	30	2	22	2	33	6	33	4
21.	57	10	30	4	22	0	34	0	34	6
28.	59	2	30	0	22	8	34	6	34	9
Mar. 7.	58	4	29	3	22	6	35	6	36	0
14.	60	0	30	4	23	2	37	0	37	6
21.	62	1	29	8	23	0	37	6	37	10
28.	64	2	31	6	23	6	37	0	37	6
April 4.	64	0	31	6	24	2	37	6	37	8
11.	65	0	33	0	24	6	37	0	7	6
18.	66	0	33	6	24	4	37	6	7	8
25.	66	8	33	0	24	6	37	6	37	9

TABLE shewing the Weekly Average Prices of GRAIN, made up in terms of 7th and Geo. IV. c. 58, and the Aggregate Averages which regulate the Duties payable on FOREIG CORN; the Duties payable thereon, from Feb. to May 1838.

Date.	Wheat.						Barley.						Oats.						Rye.						Pease.						Beans.					
	Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.		Weekly Average.		Aggregate Average.		Duty.	
1838.	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Feb 2.	55	4	53	8	33	8	29	0	28	10	19	10	19	11	20	0	16	9	29	1	28	11	27	3	32	4	32	8	21	3	32	8	33	4	19	
9.	55	4	54	1	32	8	28	10	28	10	19	10	20	0	20	0	16	9	27	7	19	1	25	9	32	7	32	5	21	3	32	11	33	1	19	
16.	55	3	54	7	32	8	28	9	28	10	19	10	20	0	20	0	16	9	29	6	28	8	27	3	32	9	32	5	21	3	32	7	33	1	19	
23.	55	2	54	11	32	8	28	8	28	10	19	10	20	9	20	1	16	9	27	6	28	8	27	3	32	10	32	7	21	3	32	0	32	0	21	
Mar. 2	55	3	55	2	31	8	28	8	28	9	19	10	20	11	20	3	16	9	30	0	29	1	25	9	33	0	32	8	21	3	32	10	32	9	21	
9.	55	4	55	3	31	8	28	0	28	9	19	10	20	6	20	4	16	9	29	3	28	10	27	3	33	4	32	10	21	3	32	5	32	7	21	
16.	56	3	55	5	31	8	28	10	28	9	19	10	20	8	20	6	16	9	31	6	29	3	25	9	33	0	32	11	21	3	32	9	32	7	21	
23.	56	10	55	8	31	8	29	6	28	10	19	10	21	2	20	8	16	9	30	7	29	9	25	9	32	9	32	11	21	3	33	1	32	7	21	
30.	57	9	56	4	30	8	29	7	28	11	19	10	21	4	20	11	16	9	33	0	30	4	24	3	32	10	32	11	21	3	33	11	32	10	21	
April 6.	58	8	56	4	30	8	29	9	29	2	18	4	21	4	21	0	15	3	31	7	31	0	22	9	33	1	33	0	19	9	33	11	33	2	19	
13.	58	10	57	3	29	8	30	1	29	5	18	4	21	10	21	2	15	3	31	8	31	3	22	9	31	11	32	10	21	3	34	2	33	5	19	
20.	58	9	57	10	29	8	29	10	29	7	18	4	21	8	21	4	15	3	31	4	31	7	22	9	33	3	32	10	21	3	34	9	33	9	19	
27.	59	0	58	3	28	8	29	9	29	9	18	4	21	10	21	7	15	3	32	9	31	10	22	9	33	7	32	11	21	3	34	9	34	1	18	

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the Quantiti Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month ; the Quant upon which duties have been paid for home-consumption, during the same Month ; and the Qu tities remaining in Warehouse at the close thereof, from 5th February to 5th May 1838.

Month ending	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN WAREHOU		
	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Tot
Feb. 5. 1838.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs.
Wheat, .	1,791 0	..	1,791 0	18 7	358 0	376 7	569,501 0	7,155 6	576,6
Barley, .	..	..	..	3 0	..	3 0	35,791 3	..	35,7
Oats, . .	840 0	..	840 0	286 1	..	286 1	248,989 1	..	248,9
Rye, . . .	..	..	..	..	..	..	11,388 3	..	11,3
Pease, . .	86 6	..	86 6	24 4	..	24 4	21,531 7	..	21,5
Beans, . .	116 0	..	116 0	20 7	..	20 7	5,299 3	..	5,2
Totals, .	2,833 6	..	2,833 6	353 3	358 0	711 3	892,501 1	7,155 6	899,6
Mar. 5.									
Wheat, . .	984 7	..	984 7	533 5	225 3	759 0	550,870 6	6,930 3	557,8
Barley, . .	..	..	..	..	..	..	35,711 3	..	35,7
Oats, . .	..	..	..	18 0	..	18 0	245,033 4	..	245,0
Rye, . . .	..	..	..	..	..	..	9,597 6	..	9,5
Pease, . .	107 5	..	107 5	47 3	..	47 3	20,934 5	..	20,9
Beans, . .	..	..	..	..	..	..	5,299 0	..	5,2
Totals, .	1,092 4	..	1,092 4	599 0	225 3	824 3	867,447 0	6,930 3	871,3
April 5.									
Wheat, . .	25 1	..	25 1	40 5	1,040 3	1,081 0	521,896 3	5,961 3	527,8
Barley, . .	0 5	..	0 5	4 1	..	..	32,045 3	..	32,0
Oats, . .	1,597 3	..	1,597 3	15 1	..	..	242,113 1	..	242,1
Rye, . . .	.. 0	..	..	4 2	..	..	7,464 0	..	7,4
Pease, . .	8	43 6	51 6	9 1	10 4	..	20,068 3	11 3	20,0
Beans, . .	22 1	..	22 1	..	..	..	5,320 5	..	5,3
Totals, .	1,653 2	43 6	1,697 0	73 2	1,050 7	1,081 0	828,907 7	5,972 6	834,8
Feb. 5. 1838.	cwt. qr. ℔	cwt. qr. ℔	cwt. qr. ℔	cwt. qr. ℔	cwt. qr. ℔	cwt. qr. ℔	cwt. qr. ℔	cwt. qr. ℔	cwt.
Flour, . .	11,982 3 7	861 2 23	12,844 2 2	20 0 15	4,156 2 0	4,176 2 15	147,252 0 17	19,477 0 7	166,72
Oatmeal, .	..	..	..	..	..	..	290 2 7	..	29
Totals, .	11,982 3 7	861 2 23	12,844 2 2	20 0 15	4,156 2 0	4,176 2 15	147,542 2 24	19,477 0 7	167,01
Mar. 5.									
Flour, . .	13,029 3 23	..	13,029 3 23	4 3 8	2,651 3 21	2,656 3 1	130,774 2 2	16,825 0 14	147,59
Oatmeal, .	0 2 0	..	0 2 0	0 2 0	..	0 2 0	290 2 7	..	29
Totals, .	13,030 1 23	..	13,030 1 23	5 1 8	2,651 3 21	2,657 1 1	131,065 0 9	16,825 0 14	147,89
April 5.									
Flour, . .	8,812 3 10	3,728 1 15	12,541 0 25	50 1 8	6,491 0 19	6,541 1 27	114,094 2 23	14,057 1 10	128,75
Oatmeal, .	..	..	..	..	..	..	296 3 26	..	29
Totals, .	8,812 3 10	3,728 1 15	12,541 0 25	50 1 8	6,491 0 19	6,541 1 27	114,391 2 21	14,057 1 10	129,04

PRICES of BUTCHER-MEAT.

	SMITHFIELD, *Per Stone of* 14 ℔.		MORPETH, *Per Stone of* 14 ℔.		EDINBURGH, *Per Stone of* 14 ℔.		GLASGOW, *Per Stone of* 14 ℔.	
Date.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
1838.								
Feb.	6/6 @ 8/	6/9 @ 8/3	6/ @ 7/	6/3 @ 7/6	6/3 @ 7/3	6/3 @ 7/	6/6 @ 7/6	6/3 @ 7/3
Mar.	6/3 7/6	6/6 8/	6/ 7/	6/ 7/3	6/ 7/	6/3 7/3	6/6 7/3	6/6 7/6
April	6/6 8/	6/9 8/	6/3 7/	6/6 7/3	6/3 7/	6/3 7/3	6/6 7/6	6/6 7/6

PRICES of English and Scotch WOOL.

ENGLISH, per 14 ℔.—*Merino*, 25/ @ 27/6 ; in Grease, 15/6 @ 20/.—*South Down*, 18/6 @ 24/6 ; *Leicester*, Hogg, 17/6 @ 22/ ; Ewe and Hogg, 14/ @ 18/6.—*Locks*, 10/6 @ 12/ ; *Moor*, 7/6 @ 11/.

SCOTCH, per 14 ℔.—*Leicester*, Hogg, 16/6 @ 19/6 ; Ewe and Wether, 14/6 @ 16/6.—Ewe, 12/6 @ 14/6 ; *Cheviot*, White, 12/6 @ 18/ ; Laid, Washed, 10/6 @ 14/ ; Unwashed, 8/6 @ 10/6 ; *Moor*, White, 7/6 @ 9/ ; Laid, Washed, 6/6 @ 8/ Unwashed, 5/6 @ 6/6.

ABSTRACT of the Nett Produce of the Revenue of Great Britain, in the Quarters and Years ended on the 5th of April 1837, *and 5th of April* 1838,—*shewing the Increase and Decrease on each head thereof.*

	Quarters ended April 5.		Increase.	Decrease.	Years ended April 5.		Increase.	Decrease.
	1837.	1838.			1837.	1838.		
	£	£	£	£	£	£	£	£
Customs, . .	4,436,505	4,061,670	. .	374,835	19,703,107	18,451,449	. .	1,251,658
Excise, ...	1,834,443	1,705,853	. .	128,590	12,715,305	11,665,748	. .	1,049,557
Stamps, . . .	1,618,462	1,648,194	29,732	. .	6,670,999	6,461,885	. .	209,114
Post-Office,	357,000	359,000	2,000	. .	1,491,000	1,519,743	28,743	. .
Taxes, ...	181,219	130,576	. .	50,643	3,681,916	3,627,105	. .	54,811
Miscellaneous,	26,334	25,841	. .	493	50,421	34,443	. .	15,978
	8,463,963	7,941,184	31,732	554,561	44,312,658	41,760,373	28,743	2,581,118
	Deduct Increase,			31,735	Deduct Increase,			28,743
	Decrease on the quarter,			522,829	Decrease on the year,			2,552,375

FIAR PRICES of the different COUNTIES of SCOTLAND, for Crop and Year 1837, *by the Imperial Measure.*

ABERDEENSHIRE.

	Imp. Qr.
Wheat, without fodder,	48/
— with fodder,	
Barley, without fodder,	26/6
— with fodder,	34/6
Bear, without fodder,	25/3
— with fodder,	33/3
Oats, Best, without fodder,	21/6
— with fodder,	31/6
— Second, without fodder,	19/6
— with fodder,	29/6
Pease and Beans,	
Oatmeal, per Boll, 140 lb,	15/6

ARGYLE.

Bear,	28/4
Oats,	24/
Beans,	48/
Oatmeal, per Boll, 140 lb,	21/11½

AYR.

Wheat,	47/1½
Barley,	28/5
Bear,	24/4½
Oats,	16/9
Pease and Beans,	32/6
Oatmeal, per Boll, 140 lb,	14/2½

BANFF.

Wheat,	50/7
Barley, without fodder,	27/2
— with fodder,	33/2
Bear, First, without fodder,	24/2
— with fodder,	30/2
— Second, without fodder,	22/
— with fodder,	28/6
Oats, Potato, without fodder,	20/6½
— with fodder,	30/0½
— Common, without fod.,	18/10½
— with fodder,	28/4½
Pease,	
Beans,	
Oatmeal per Boll, 140 lb,	15/1

BERWICKSHIRE.

	Imp. Qr.
Wheat,	49/4½
Barley, Merse,	24/6
— Lammermuir,	21/6
Oats, Merse,	21/8½
— Lammermuir,	20/2½
Pease,	34/9½
Oatmeal, per Boll, 140 lb,	16/3

BUTE.

Wheat,	49/11
Barley,	28/11½
Bear,	25/9
Oats,	20/10
Pease,	34/
Beans,	34/
Oatmeal, per 140 lb,	15/2½

CAITHNESS.

Bear,	22/4½
Oats, Potato,	20/
— Early Angus,	18/
Oatmeal, per 140 lb,	16/3½

CLACKMANNAN.

Wheat,	47/0¾
Barley, Kerse,	30/7
— Dryfield,	28/1¼
Oats, Kerse,	19/3¼
— Dryfield,	19/6¼
— Black,	17/3¼
Pease and Beans,	31/8
Malt,	51/
Oatmeal, per Boll, 140 lb,	16/

DUMBARTON.

Wheat,	48/8
Barley,	30/3
Bear,	27/3
Oats,	20/9
Pease and Beans,	36/10
Oatmeal, per 140 lb,	16/2

DUMFRIESSHIRE.

	Imp. Qr
Wheat,	52/8
Barley,	26/
Bear,	25/4
Oats, Potato,	19/4
— White,	17/4
Pease,	34/
Beans,	32/9
Rye,	32,6
Malt,	60/
Oatmeal, per 140 lb,	15/

EDINBURGH.

Wheat, First,	54/0
— Second,	50/
Barley, First,	27/9
— Second,	24/
— Third,	21/
Oats, First,	21/3
— Second,	19/
Pease and Beans,	33/7
Oatmeal, per Boll, 112 lb,	13/

ELGIN AND MORAY.

Wheat,	52/3
Barley,	28/9
Oats,	20/7
Rye,	32/6
Pease and Beans,	32/
Oatmeal, 112 lb,	14/7

FIFE.

Wheat, White,	47/8¼
— Red,	45/8¼
Barley,	24/8¾
Bear,	23/2¾
Oats,	20/2½
Pease and Beans,	27/10½
Rye,	25/1½
Malt,	50/6
Oatmeal, 280 lb,	33/9
— by measure,	32/3

FORFAR.

Wheat,	52/1
Barley,	24/8
Bear,	22/9
Oats, Potato,	21/7
— Common,	20/8
Pease and Beans,	28/11
Rye,	25/
Oatmeal, 140 lb,	16/3

HADDINGTONSHIRE.

	Imp. Qr.
Wheat, First,	59/4½
——— Second,	55/6½
——— Third,	51/10¼
Barley, First,	34/0¼
——— Second,	32/0½
——— Third,	29/5¾
Oats, First,	24/11¾
—— Second,	23/2¼
—— Third,	21/11¼
Pease and Beans, First,	34/9¼
——————— Second,	32/6¾
——————— Third,	30/9½

INVERNESS.

Wheat, without fodder,	48/9
——— with fodder,	54/
Barley, without fodder,	29/
——— with fodder,	33/6
Oats, Pot. & Hop. without fod.	22/6
—————— with fodder,	29/
—— White, without fod.	21/
—————— with fodder,	27/6
—— Black, without fod.	8/6
—————— with fodder,	14/6
Oatmeal, per Boll, 112 lb,	14/11¼

KINCARDINE.

Wheat, without fodder,	50/
——— with fodder,	58/6
Barley, without fodder,	24/
——— with fodder,	30/6
Bear, without fodder,	21/5
——— with fodder,	27/11
Oats, Potato, without fodder,	22/7
—————— with fodder,	30/1
——— Common, without fod.	19/5
—————— with fodder,	26/11
Pease, without fodder,	27/6
——— with fodder,	37/6
Beans, without fodder,	29/6
——— with fodder,	39/6
Oatmeal, per 140 lb,	16/3

KINROSS.

Wheat,	46/2
Barley, First,	25/
——— Second,	22/
Bear, First,	21/
—— Second,	18/
Oats, White, First,	19/6
—————— Second,	17/
—— Black, First,	16/
—————— Second,	13/6
Pease and Beans,	28/
Oatmeal, per 280 lb,	30/10

KIRKCUDBRIGHT.

Wheat,	54/4
Barley,	26/5¼
Oats, Potato,	18/4
—— Common,	16/8
Oatmeal, per Boll, 140 lb,	15/

LANARKSHIRE.

	Imp. Qr.
Wheat, First,	53/6
——— Second,	49/3
Barley,	27/2¼
Bear, First,	24/10¼
—— Second,	21/10
Oats, First,	20/9¾
—— Second,	17/10¾
Pease,	40/
Beans, First,	36/
——— Second,	30/
Oatmeal, per Boll, 140 lb.	15/8¼
——— Second,	14/3
Malt,	56/4

ARCHBISHOPRIC OF GLASGOW.

Barley,	27/2
Oats,	19/11
Oatmeal, per 140 lb,	17/

LINLITHGOW.

Wheat,	52/
Barley,	28/1
Oats,	20/3
Pease, and Beans,	33/
Malt,	48/9
Oatmeal, per 140 lb,	16/

NAIRN.

Wheat,	51/
Barley, without fodder,	28/
——— with fodder,	33/
Oats, without fodder,	20/6
——— with fodder,	27/
Oatmeal, per 112 lb,	14/2

ORKNEY.

Bear,	
Malt,	
Oatmeal, per 140 lb,	

PEEBLES.

Wheat, First,	57/8½
——— Second,	53/2¼
——— Third,	47/8¼
Barley, First,	27/9¾
——— Second,	26/4¼
——— Third,	24/3
Oats, First,	19/9¾
—— Second,	18/6¼
—— Third,	16/10¾
Pease, First,	33/3¼
—— Second,	32/1½
—— Third,	30/6
Oatmeal, First, per Boll, 112lb,	12/11¾
——— Second,	12/7
——— Third,	12/0½

PERTH.

Wheat, First,	52/1
——— Second,	42/
Barley, First,	26/5
——— Second,	23/10
Oats First,	20/3
—— Second,	17/5
Pease and Beans,	27/7
Oatmeal, per Boll, 140 lb,	15/3

RENFREWSHIRE.

Wheat, First,	49/10
——— Second,	48/9¼
Barley, First,	30/7½
——— Second,	30/0½
Bear,	26/8¼
Oats, First,	19/1¾
—— Second,	19/1
Pease and Beans, First,	33/10¾
——————— Second,	33/3¼
Oatmeal, per Boll, of 140 lb,	15/3¼
——— Second,	15/3

ROSS AND CROMARTY.

	Imp. Qr.
Wheat, First,	46/6½
——— Second,	
Barley,	30/5¾
Bear,	21/
Oats, Potato,	22/5¾
—— Common,	21/6
Oatmeal, per Boll, 140 lb,	17/0½

ROXBURGH.

Wheat,	52/
Barley,	25/10¾
Oats,	21/10¾
Rye,	
Pease,	34/10¾
Beans,	37/4
Oatmeal, 140 lb,	16/11¼

SELKIRK.

Wheat,	50/
Barley,	25/7
Oats, Potato,	20/
—— Common,	19/1
Pease,	34/
Oatmeal, per 280 lb,	32/6

STIRLING.

Wheat,	47/
Barley, Kerse,	29/4
——— Dryfield,	28/
Oats, Kerse,	19/9
—— Dryfield,	18/8
—— Muirland,	16/4
Pease and Beans,	
Malt,	52/
Oatmeal, per Boll, 140 lb,	15/3

SUTHERLAND.

Wheat,	
Barley,	26/6
Bear,	24/6
Oats, Potato,	22/
—— Common,	20/6
Pease,	35/6
Rye,	30/6
Oatmeal, 140 lb,	17/

WIGTON.

Wheat,	46/4
Barley,	26/4
Bear,	23/4
Oats, Potato,	16/8
—— Common,	14/8
Pease and Beans,	31/2
Rye,	22/
Malt,	65/8
Oatmeal, 280 lb.	29/

We may inform our English Readers, that the Fiar Prices are the average prices of grain as ascertained every year by the verdicts of Juries in every county of Scotland. These Juries are summoned in Spring, and ascertain from the evidence produced to them the average prices of the preceding crop. By these prices, rents payable in grain, and similar contracts, are generally determined; but the main object is to convert into money the stipends, for the most part payable in grain, of the Scottish Clergy.

THE

QUARTERLY

JOURNAL OF AGRICULTURE.

ON THE CAUSES OF THE DESTITUTION OF FOOD IN THE HIGHLANDS AND ISLANDS OF SCOTLAND IN THE YEARS 1836 AND 1837.

By Mr Alexander Macgregor,
Licentiate of the Church of Scotland, Manse of Kilmuir, Skye.

A thorough knowledge of Highland manners and character is essentially necessary to form a proper estimate as to the circumstances and condition of the inhabitants of the Highlands and Islands of Scotland. It is not enough to have a knowledge of their present state, but the different changes which have taken place from time to time in their condition as a people, must be traced back to remote periods. Various causes have combined to render the Highlanders of the present day, as if a race entirely different from that of their forefathers. Some centuries ago, when feudal law reigned with absolute sway in every Highland district, agriculture, even of the rudest description, was but little attended to or looked after. The young and hardy men, from the days of boyhood upwards, were destined for employments entirely different, and such as were more suited to their warlike temperament of mind, to the principles in which they were daily instructed, and to the usages of the periods in which they lived. It was then that the Highland chieftains, like petty kings over their respective domains, had each a stated number of followers or retainers, according to their power, as well as to the extent of their possessions. These possessions were not valued, as now, according to the amount of rents raised from them, but according to the number of men upon them able to carry arms, and willing to fight for their feudal lord in his combats with some neighbouring chief. Depending more on the chase, and on spoils from their enemies, for subsistence, than on agriculture, the "crànn-tàraidh," or "gathering-beam," commanded more attention than the plough. That such should be the case, will not appear so surprising, when it is considered that all who slighted the call of this mute messenger of death, were either irretrievably disgraced, or put mercilessly to the sword. In those rebellious times, however, the Highlands were not so densely peopled as at the present day. The population were more dispersed over the face of the country, and in reality less numerous. Even should a time have been when the Highland families would equal in number those of later times, it is rational to suppose that the dangers, hardships, and conflicts to which the Highland youth were then exposed, would have a direct tendency to decrease the population, or at least would prove an effectual check to its increase. The feuds and conflicts among the clans were not confined to any particular county or district, neither did they take place at the same period of time. On the contrary, every Highland territory suffered in its turn, for a revolution of centuries, from the ravages of intestine broils, and deadly skirmishes. So severe were the contests between the Clan-Chattan and the Mackays in the north of Scotland, in the reign of Robert III., that that monarch deemed it proper to send the Earls of Crawford and Murray to effect a reconciliation between them. For this purpose the said noblemen, after due deliberation, deemed it advisable to have recourse to policy, and by appointing an equal number of men on each side, to fight as champions for their respective clans, the victorious party were to be honoured with royal favour, while the vanquished party were to receive free pardon for all their former offences. Reconciliation was thus effected between these bold and barbarous clans on the North Inch of Perth, in the year 1396. In the same manner bloody feuds were carried on, with varied success, between the Clan-Donuill and the Macleans,—the Clan-Donuill and the Macleods,—Lord Kintail and Glengarry,—Rasay and Gairloch,—Sutherland and Caithness,—the Siol-Torquil, or the Macleods of Lewis, and various enemies on the mainland of

Scotland, &c. Under such a state of affairs, there was neither leisure nor desire to effect any such changes as would ameliorate the condition of the people in their domestic comforts. Lands were little valued by their owners in a pecuniary point of view; and the proprietors frequently awarded large shares of their possessions, during life, to their seanachies, bards, pipers, and to such of their retainers as distinguished themselves by acts of bravery and military prowess.

Such was the state of affairs in a more or less degree until the close of the Rebellion in 1745–6. When the last ray of hope in favour of the house of Stuart had vanished, and when the house of Hanover had come to wield with undisputed right the British sceptre, things assumed a more gentle aspect. Feudalism vanished by degrees under the influence of Protestant laws judiciously enforced, and the wild spirit of the Highlanders was softened down to that pitch of tranquillity, which enabled them to live on peaceable and easy terms with their neighbours and with each other. Their minds were no longer distracted by wars and deadly feuds with their surrounding clansmen. These were happily forgotten, except when rehearsed in their tales, or chanted in their ancient Gaelic songs.

The Highlanders (though not now exposed to the dangers of civil commotions around them, and though no longer called out by their liege lord to plunder the effects and to destroy the retainers of some contiguous enemy) were still possessed of much ardour in military affairs, and displayed courage which was surpassed by no race of men whatever. It therefore fell to the lot of many of them to enlist in the Highland regiments; and of this brave people these regiments were, at one time, exclusively made up. Better soldiers never faced an enemy; and as Dr Macleod so justly said in his eloquent address at the Mansion-house, "These are the men who in every field and in every clime had covered themselves with glory." The numbers who were thus engaged in fighting their country's battles, bore but a small proportion to the numbers of those at home, who had now to depend on industry and labour for their maintenance. But still the aggregate of population was but very small, when compared with that of the present day. This may be illustrated by the parish of Kilmuir in

Skye. In this parish stand the magnificent ruins of Duntulm Castle, a strong Danish fort, which the noble Clan Macdonald made choice of as their residence, and enlarged for that purpose. And the fact that the Macdonalds were powerful chiefs, who always maintained their dignity and reputation as renowned warriors, is a sufficient proof that their retainers would, if possible, be as numerous, to say the least of it, as those of any other feudal lord. But the population of Kilmuir was, in the year 1736, only 1230 souls. Nineteen years afterwards it amounted to 1572 souls. In 1791, it amounted to 2060. In 1831, it was 3415 ; and now it amounts to about 4000 souls, though at various periods within the last sixty years considerable numbers have emigrated to America. The increase in this parish for the last century is therefore nearly four-fold ; and a tolerably correct idea of the increase of the population in the Highlands in general may be formed from the facts now stated in reference to Kilmuir.

There is reason to suppose that, during the time which intervened between the period when the Highlanders mainly depended for subsistence on the bounty of their liege lords, and the period when they had for that purpose to engage in public works of industry, their circumstances and modes of living must have been of the most ordinary description. They had not been trained in general to those public sources of employment, which afterwards turned out so lucrative, and which justly engaged their sole attention,—such as the rearing and managing of black cattle for the southern markets,—the manufacturing of kelp,—the fishing and curing of herring, &c. Such ordinary or inferior modes of living were not at this time peculiar to the Highlanders, but were prevalent also among the great bulk of the population in the southern and western counties of Scotland, even as late as the middle of the last century. " To those," says a late historian of Scotland, " who are not old enough to remember having seen the last remains of it in operation, no description can give any thing like an adequate idea of the wretched economy that was at this period prevalent." Even the plough made use of at this time in those localities was of the ancient Scottish make, having four horses yoked in it, which were led by a man walking backwards.

The horses, which were small and shaggy, were accoutred in the most antique manner, having collars made of bulrushes, to which was attached a rude harness made of hair clipped from horses' manes and cows' tails. When the implements of husbandry were so very primitive in kind, it is natural to think that all the other appointments of the people corresponded with them. Their dwellings were miserable huts, through every part of which the rain had free access, washing away the soot which had feathered upon the beams and rafters, and causing it to drop like showers of printing-ink upon the culinary utensils underneath, as well as upon every thing else which lay in the way. Yet under this rude system the people are said to have lived contentedly, little desirous of a change, as they knew nothing of its comforts. In the eastern counties of the Lowlands of Scotland, agriculture had even at this time been brought to some degree of perfection. The spirit of improvement soon found its way into the west, and remarkable changes were speedily effected in the habits of the people, and in their modes of operation. Spinning-mills were erected in various quarters by wealthy companies, whereby cotton was manufactured into the various fabrics in which it is seen at the present day. Weaving, sewing, tambouring, dyeing, and printing, were each lucrative and extensive sources of employment, which gave an impetus to a variety of arts necessarily connected with them. Work was thus procured for men, women, and children, and a spirit of emulation, together with a taste for improvement, found way into every hamlet. The lowly farm-steading gave place to the stately mansion, surrounded with its group of offices, alike for comfort and convenience. And while commerce thus flourished, agriculture kept regular pace with it. "Hedging, ditching, planting, and improving," says Struthers, the author already alluded to, "called forth energies of which no one knew he was in possession, till in the person of his neighbour he beheld them in full operation. The beautiful hedgerows, the thriving clumps, and the convenient enclosures of one proprietor, excited the taste and awaked the emulation of another, till hands could with difficulty be found to execute, or a sufficiency of materials to complete, the improvements that were in progress; while each, astonished at the beauty and fertility that so suddenly began to glow around him, was anxious to engage in new and still more extensive experiments."

While the Lowland districts alluded to thus emerged from a state of comparative sluggishness and inactivity, the poor Highlanders had various insuperable obstacles to contend with in their progress to improvement, granting even that they had been inspired with a taste for such processes of civilization and domestic economy as they stood so much in need of. They were a distinct and separate people, who associated but little with their more highly favoured countrymen around them, and who could have but little or no traffic, by way of commerce, with distant parts of the world. Their language differed with that of the rest of the nation. They had neither roads, nor canals, nor commercial cities, to facilitate, or even in the remotest degree to encourage, the march of civilization among them. Though no people could be more brave and heroic, none more loyal to their king and their country, none more honest, upright, and hospitable, yet their inherent and native virtues, though pleasing and praiseworthy in themselves, were insufficient to raise them in the scale of useful and practical improvement. To effect this, some external impulse behoved to be made to bear upon them, and many barriers would require to be wholly removed.

After the lapse of some time, when the clamour of arms had ceased, and the din of war subsided,—when the Highlanders were permitted to enjoy a share of that domestic repose which had been for centuries denied them, they were naturally impelled to have recourse to such resources as were within their reach, for the purpose of bettering their condition, as well as for permanent means of livelihood. The inhabitants of the Hebrides, and of certain parts of the western coasts of the Scottish Highlands, engaged themselves in the manufacturing of kelp, as well as in the catching and curing of herring and other fish; while the natives of the Highlands and Islands in general were more or less in the habit of rearing black cattle for the English markets. The fall in the price of kelp, or rather the ceasing of kelp manufacture, in consequence of the reduced duties on salt and barilla, proved a most severe stroke to thousands and tens of thousands, who profited extensively by the manufacturing of that commodity; and this may justly be looked upon as *one of the principal remote causes which led to the late destitution.* In most parts where kelp was made, every person had the sea-ware of that portion of the shore which was opposite to his farm, for the purpose of converting it to kelp. The tenants thus manufactured it, and when ready for the market it was purchased by the proprietor, at a rate which considerably exceeded the rent of the farm. Thus the landlords had the comfort of regularly paid rents, and the tenants had the same. About the year 1803, both kelp and cattle fetched prices unprecedentedly high. Landlords naturally supposed that the state of their tenantry could bear an increase of rent, which having in most cases been laid on, they took the kelp into their own hands, and allowed their tenants a certain sum of money per ton for manufacturing it. There are places, however, where this did not take place; and though of little or no value, many farms have the kelp attached to them to this day. Such hamlets as were not contiguous to the sea-shore, and could derive no direct benefit from kelp, were let at rents proportionably low. An idea may be formed of the immense profits which arose from the making of this commodity to both landlord and tenant, when it is considered that at one time every ton brought a price of L.16 Sterling and upwards. It then fell by degrees to L.12, L.8, L.6, and L.4 Sterling per ton. In place of the high remuneration derived at one time by the tenants for their labour in kelp making, they were ultimately paid with even as low as two guineas for making each ton.

While the decline in kelp manufacture thus proved an incalculable loss to both proprietor and tenant, the fall in the price of black-cattle, for a series of years back, aided vastly the progress of the approaching calamity. Napoleon Bonaparte, whose ambitious and bloody career disturbed the peace of Europe for such a length of time, may justly be considered as another principal remote cause which led to the late destitution. In course of the late protracted and expensive wars, black-cattle of every description quickly rose in value. High prices were asked, and readily obtained,—prices which considerably exceeded the intrinsic value of the commodity exposed for sale. It may be said of kelp, that the benefits derived from it were naturally confined to the localities in which it was manufactured. Such was undoubtedly the case, but the same thing held true with regard to the rearing of black-cattle, with this advantage, that they were a general staple commodity, reared to a more or less extent in every quarter: and now that the prices have fallen, the disadvantage is equally general, and the causes of complaint equally loud in every Highland county and parish. Cattle having thus speedily risen in value, by an impulse which could neither be durable nor certain, and all kinds of traffic being at the same time brisk, a higher value was set upon the lands, and, as a consequence, they were held by the tenant at a higher rate from the landlord than was formerly done. Through time the different sources by means of which the tenant, through his industry and exertions, benefited himself, almost entirely failed. As a matter of course, he experienced much difficulty in maintaining himself and family on the scanty produce of some acres of ground, accustomed as he had been to accumulated profits from the sale of cattle, kelp, and fish. The evils which arise from the depression in value of such Highland commodities as have been alluded to, have found their way from the toiling tenant to his indulgent landlord. The connection which subsists between landlord and tenant is distinct and immediate. The prosperity of the one immediately affects the other, and they live in mutual dependence. In consequence of the failure in kelp alone, some proprietors have been deprived of one-half of their wonted incomes, and some of even two-thirds; and thus they suffer alike with their tenants from the causes already mentioned.

Another principal remote cause which led to the late destitution, and which contributed largely to the poverty of the islanders in particular, is the failure of the herring-fisheries. While kelp and cattle sold at the advanced prices already stated, herring abounded in immense shoals in the numerous lochs, bays, and creeks, which intersect in every part the western isles and coasts of Scotland. These were caught with little trouble, and at comparatively small expense, by the natives; and after furnishing themselves with large supplies for their own consumption, they disposed of the rest to numberless crafts and small vessels which resorted in large fleets from the south, to every convenient bay and anchorage around the rocky coasts of the West Highlands. This resource, like the rest, has almost entirely failed, as the quantity of that excellent fish which is now caught is so exceedingly small, that it bears hardly any proportion to the thousands of barrels cured of it, at a time when the circumstances of the people would have enabled them to dispense with it much easier than now. It would appear that the natural history of this prolific fish is very little known, for such as have been for years engaged in catching it, seem as ignorant of its motions and migrations as those who never attempted to ascertain them. Many fruitless investigations have been made on this subject, and the probability is, that it will remain a problem never to be satisfactorily solved. It has been observed, that since the fisheries became so productive on the north-east coast of Scotland, the herring has almost entirely deserted the west. It is thought, however, that this desertion consists more in the manner of the visits, than in the non-appearance of this capricious fish. That it does not frequent the lochs and indentations, which it at one time made a resting place, is quite certain; but it is equally certain that it annually passes by, both in the deep sea and in the open channels, where it might be caught in large quantities by the natives, were they possessed of skill and means for such an undertaking. Some people attempt to account for its deserting the localities which it formerly visited, by its being scared away by the numbers of steam-packets which now ply from port to port on the west coasts, whose paddles cause unusual commotions in the streams and currents. This argument, however, for its non-appearance seems to have but little weight.

In consequence of the failure in the means of livelihood just enumerated, the poor Highlanders were more than ever under the necessity of having recourse to various shifts and expedients to enable them to earn a scanty subsistence, and to pay the rents of such portions of land as were occupied by them. As little or nothing could be done at home to get this desirable end accomplished, the able men resorted in great numbers to the south, and to such other places as could afford them labour; while the women went annually to the Lothians, and even to the northern counties of England, to procure employment at harvest work. In so doing they underwent almost incredible hardships in their wanderings, while at times they had, after coming home, but a few shillings for their trouble. And this is not all; they frequently carried along with them a variety of disorders, such as measles, small-pox, fevers, &c., and thus conveyed the infection to their friends, and rendered such disorders very destructive in the country. It frequently happens that some of them die when in those remote localities, and the consequence is, that an immediate demand is made upon their native parish to defray their funeral and other expenses; and from the poverty of those parishes, it becomes at times a serious matter to meet such demands.

When that great national work the Caledonian Canal commenced in 1803, it afforded lucrative employment for many hundreds from Skye and the Long Island. Even from Skye alone between three and four hundred labourers went annually to that great undertaking, at which they earned individually from L.10 to L.15 Sterling in the half-year. While this work lasted, considerable sums of money were brought annually into the island, which proved of vast advantage to the community. About this time also great numbers found employment at the making of public roads in Glengarry, Kintail, Lochalsh, Lochcarron, &c. In the year 1807 the making of roads commenced in Skye, which for years afforded convenient work for many people.

To add to the many disadvantages of the poor islanders in particular, public labour is now hardly to be found any where, even at a reduced rate of pay; and though hundreds of both sexes migrate yearly to other counties in quest of such work as they may fall in with, they return to their homes at the close of the season, much broken down in spirit and constitution, with small pittances, which can go but little way to meet the several demands made upon those who so distressingly earned them.

The causes already mentioned as having led, in a remote manner, to the late destitution, are chiefly of an external nature, or such as over which the sufferers had no direct control. The poor Highlander could not help those legislative enactments, or alterations in the commercial policy of the nation, which led to the reduction on salt and barilla, thereby depreciating the value of kelp. He had no power over the migrations of the herring, or over the causes which led that capricious fish to desert those lochs and bays where it was once so profitably caught and cured. He had no sway whatever over those impulses by which the price of black-cattle rose and fell, and ruined his prospects. But there are remote causes yet to be considered, which led to the late destitution, over which the Highlander, and those who take an interest in his welfare, have some degree of control, and cannot, like those already alluded to, be termed of an external nature. These causes now come to be briefly mentioned and discussed in the following order:

1. An excess of population;
2. Early and improvident marriages;
3. The lotting-system, and the continued subdivision of lands; and
4. Bad husbandry, or the mismanagement of domestic economy.

Though these causes are thus classed for greater facility in treating of them, yet in reality they mutually take their origin from each other, and act as it were in concert, to render the condition of the poor Highlander more and more miserable.

Be it observed, 1*st*, That an excess of population is an undoubted cause which led to the late destitution. From what has been already stated in reference to the parish of Kilmuir, it will be seen how enormously the population has increased for the last century. At the present day the lands are so overburdened with people, that in favourable seasons they yield, under the system of husbandry pursued, but a very scanty livelihood for the population; so that, when failure in the crops ensues, from whatever cause that may arise, destitution in a greater or less degree is the inevitable consequence. No class of people can perhaps be found who are more patient, content, or enduring than the Highlanders. Various were the hardships which they have put up with in silence. Many and severe were the privations under which they have lived, without uttering a sentence of complaint even to their neighbours or intimate friends. Their very food at times has been such that perhaps no other people could have subsisted upon it, and none would have done so with that forbearance and resignation which they so silently displayed. Their principal means of support, in every season, are potatoes. Few can afford to supply themselves with animal food, and even in maritime districts there are many poor families who can procure no fish. Several causes have led to the increase of the population. Since the termination of local feuds, and latterly since a general peace has shed its blessings over the country, the Highlanders were permitted to enjoy a degree of quietude and repose previously unknown. Their young men, in place of being called out to take a share in the defence of their king and country, were left at home to branch out by degrees into separate families, and to increase a population already sufficiently numerous. If that most useful and prolific root, the potato, had not been raised in such immense quantities, it would have been impossible for the lands to afford any other crop which could possibly support the present population. About sixty-five years ago there were no more potatoes planted than what was sufficient to serve the family at their Christmas dinner, after leaving a little for seed, which they bundled up in a mat of bulrushes, which for security was suspended to the roof-tree of their dwellings, as a safe keeping-place, until the season of planting ensued. But the principal cause which led to the great increase of population, and consequently to the late destitution, is,

2dly, While the young Highlanders are a peaceable, orderly, and even industrious class of people, they are notwithstanding highly improvident as to the future. Possessed of an easy disposition, and blind to future consequences, they are too apt to be satisfied with such little earnings as they may get possession of, after months of hard labour in some distant part of the kingdom, and suppose that thereby they are in circumstances which entitle them to enter upon the marriage state, and set up separate families for themselves. They live under the impression that a good wife is certainly worthy of her maintenance, and while so far they judge aright, they fail in taking into the account, how that maintenance is to be procured, or how provision is to be made for the number of little ones, who will, as a matter of consequence, group in a few years about their solitary hearths. No doubt seasons of repentance will overtake them, when too late. But on this subject they keep silent. They labour and toil late and early, far and near, to keep their destitute families alive; and in despite of all their exertions, their children must live in poverty and rags. Yet the fate of one gives no warning to others. Each successive year adds to the number of these improvident youths; and nothing can be more evident than, when their desultory and precarious means of subsistence receive any check, either by the failure of public works, by sickness, or by death, their poor families, totally unprovided for otherwise, become a burden to their friends or to the public at large. And the very evil thus complained of leads,

3dly, To the lotting system, and the continued subdivision of lands, which very materially unfitted the Highlanders to meet the late destitution. When the population of the Highlands had by degrees increased considerably beyond its usual number, several proprietors deemed it necessary to divide farms, which were originally somewhat extensive, into lesser lots and crofts, with the intention of supplying each family with less or more possessions. Though this was done with humane and charitable views, to the great personal inconvenience of the proprietors themselves, yet the system, from the facility and temptation it afforded to single men for taking up families, had in a very short time, of course, a very sensible effect upon the population. And pernicious as were the results of this first subdivision, the evil has always gone on increasing, from continued subdivision and subletting, generally unknown to the proprietors. The common custom is, that when the son or daughter of a lotter or crofter marries, the newly married couple are received by the parents of either party, with whom they live for some time as one family; but eventually the said parents cut off a portion from their own little possessions, for the young people, on which they build a house, and become liable to pay the original occupier a share of the rent, in proportion to what was thus allowed them in subset. The old people who originally occupied the lot or croft, generally portion off their lands in as many shares as they have of sons and daughters unmarried. In some time after the first member of the family marries, another does the same, who immediately gets his share of the croft, and builds his house, then another and another, until the original occupier be ultimately left with a share no larger than any of those given away to his children. He stands as federal head over the whole, and is alone accountable for the rents to the proprietor. All this take place on a tenure of land too small for the comfortable support of the original occupier. On many farms, by means of this baneful system, the population has doubled within the last sixteen years. The subtenants just mentioned can never raise the rents from the produce of their possessions. At times they cannot keep a single cow upon them to furnish their children with a little milk. They trust to chance employment for means to pay for their contracted possessions, which tend, in general, to no purpose but to bind them in poverty to one locality. It must also be considered, that, notwithstanding this continued sub-division, there are more families who have no lands than there are who have. An example of this may be given from Kilmuir, exclusive of the Government district attached to it. In the parish just mentioned, there were in February last (1837) 421 families, and the number of lots and crofts, together with four farms occupied by large tacksmen, is only 190. From this it is seen that 231 families have no lands whatever from the proprietor. Of these 231 families, 101 hold shares of lots and crofts, as above described, and the remaining 130 families occupy lands in no shape whatever, but subsist upon the half-foot system, which will be immediately described. The vast number who occupy no lands, wish of course to have them, and rather than want some sort of possession in this respect, they would be contented with any thing; and thus they tend, if possible, to increase the evil which is already too extensive and prevalent. Should the number of families be reduced to an equality with the number of lots and crofts, the population after all would be sufficiently

numerous. The occupiers of lots can keep in general n
than two cows, and no horse; while the crofters, whose
are larger, keep of course more cows, but are seldom :
keep any horses, with the exception perhaps of small
which a few of them endeavour to have, for assisting in
ing home fuel and other little necessaries. Some are t
to lay a great share of the existing poverty to the ch
the Highland proprietors; but it should be taken into
deration, that though the proprietors were in many c
give a free grant of their lots and crofts to their prese
piers, poverty would not after all cease, owing to an ex
population living under a rude system of husbandry.
the example given in reference to Kilmuir, it will be ob
that over more than one-half of the population of the
the proprietor has no control whatever. Out of 421 fa
there are 231 who neither pay rents to the proprietor,
they consider themselves in any respect under his jurisd
while they live peaceably on their own scanty earnings.
der such a state of things, injury is done to all parties.
poor landless cottars are directly or indirectly a burden
occupiers of land, whose circumstances they eventually
and, when once injured, the proprietors suffer according

The "*half-foot*" system, under which such a vast mu
of cottars contrive to eke out their scanty means of
comes now to be described. These people are undou
the poorest and most dependent of all the Highland p
tion. They generally rear their dwellings about the ou
of large tacksmen's farms, as well as in every locality
they can find a footing. They meet with kindness and
gence to a degree which those on whom they are a burd
in general but ill afford. Such of them as raise small
tities of oats, do so in the following manner: The tac
allots a portion of ground for them, which they till wi
"căs-chrom," and when ready for sowing, the tacl
nishes one-half of the seed, and the cottars t ot
The cottar then sows and harrows the gr d, wh
watches and protects until harvest, when he re se
the one-half of the sheaves for the tacksman, as r
for the ground, and the other half for himself. In

manner, also, the cottar raises potatoes for his family. As the potatoes require manure, the tacksman allows him to cut sea-ware, which he carries in creels to the ground; and after receiving one-half of the seed from the tacksman, furnishing the other half himself, he plants the same, and watches over its growth, until he lift the potatoes in harvest, when he gives one-half the produce for the use of the ground, and has the other half for himself. Sometimes the cottar is permitted to have a cow, which is allowed to range with the other cattle of the farm. In this case, besides the oats and potatoes which he raises on the " half-foot " system just described, the land-occupier generally gives him a piece of ground wherein to plant potatoes with the manure of his cow, the produce of which he keeps entirely for himself. For the said cow and ground he pays the land-occupier, partly perhaps in money, but for the most part in labour, either as " grass-keeper," or by cutting peats, mowing grass, reaping corn, or such other employments as may be required about the farm.

After this manner, therefore, that class of the population just spoken of endeavour to earn a livelihood; and while it is in no respect calculated to raise themselves to a state much above abject poverty, it proves a great bar in the way of agricultural improvement, and gives every encouragement to what was to be considered in the

4th place, viz. *Bad Husbandry*, or the mismanagement of Domestic Economy. That little or no improvement can be effected in the various departments of husbandry under the present excessive population, is a self-evident fact. That much improvement is both practicable and required, is an equally plain and palpable truth. Where the processes of husbandry are either neglected, or carried on under a bad system, the population depending on the same for their means of support, are necessarily unfitted for encountering such a visitation of Providence as the late destitution.

Throughout the northern islands of the Hebrides, in particular, the lands, from continued sub-division and sub-letting, are cast into lots so exceedingly small, that the occupiers can keep no horses to plough or harrow the ground, or to execute those multifarious processes of labour, which are exclusively allotted to horses in other quarters of the kingdom. What is thus in other parts of the country performed by horses, the poor hard-toiled Hebridean must perform for himself. In lieu of the plough, he must late and early ply his "căs-chrom," or crooked spade. This primitive kind of utensil resembles the stilt of a plough, with a straight piece of wood attached to the lower end of it, forming an obtuse angle, and having a socket of iron on the part that enters the ground. The stilt is held with both hands, and the lower part or "sole" is driven into the ground by means of a peg, on which the right foot rests and presses. The instrument is exactly a crooked lever, in which the power is to the weight nearly as 1 to 3½.

Though the "căs-chrom" is much more expeditious in tilling than the common spade, yet it becomes a tedious and most laborious task to till several acres of ground with it. The consequence is, that the poor people must begin the work of cultivation even as early as Christmas, and keep toiling at the same under the boisterous and rainy climate of their country, until the middle or end of May, ere their labours are finished. By being thus exposed to the inclemency of the weather, they are seldom either dryly clad or shod. From this arises among them the prevalence of inflammatory complaints, diseased action of the lymphatic system, as also acute rheumatism, pleuritic diseases, typhus fevers, &c.

Besides that the "căs-chrom" mode of tilling is both toilsome and tedious, it very much injures the ground, as it does not turn it up in that regular manner which is accomplished by the plough. And this is not all; when cultivating with this instrument, it is found necessary to convert the field into long, narrow ridges, and rounded on the top by heaping up the earth to carry off the water. The said ridges are also made as crooked, irregular, and distorted, as the characters in the Greek alphabet: and while the latter has no more perhaps than four acres in all, much of even that is lost by the broad and useless spaces which are left between the ridges.

When the ground is turned over, the sowing commences, which is generally performed in a slow and awkward manner. The sower goes backwards, and having a fistful of seed, he shakes his hand with the same three or four times, in a vertical position, before he disposes of it and is ready for the next. The harrowing then takes place, which the women for the most part execute, by dragging after them the fatiguing instrument. Owing to the lightness of the harrow which the poor women are thus capable of dragging after them, the ground cannot be made sufficiently smooth; and to remedy this they commence anew, with another instrument, called the "racan," which gives a smooth finish to the whole. The "racan" is merely a block of wood, having a few teeth in it with a handle about three feet in length. The poor people must also convey sea-ware from the shores, manure from their houses to the field, and peats from the hills to their dwellings, with the creel on their backs, which is fastened there by a belt passing over their breasts. In harvest they have no alternative but to carry home the produce of their possessions the best way they can, the potatoes by the creels, and the corn in bundles upon their backs.

It will readily be acknowledged on all hands, that this bad system of husbandry can turn out to no real advantage either to proprietor or tenant; and while the population continues as it is, it is no easy matter to effect any remedy. While possessions are so small, the occupiers of land can keep no horses, and consequently no alternative is left them but to drag out a weary existence in the manner just described. From the want of draining enclosures, as well as from the tardy manner of cultivation, sowing is unavoidably very late; the consequence is, that, ere the crops are ripe, or ready for cutting, they are liable to be overtaken by the storms and hurricanes so incidental in the Highlands, particularly about the autumnal equinox. It is a correctly ascertained fact, that the climate, though naturally wild and boisterous, may be greatly mollified by hedging, trenching, fencing, and improving the lands in the various modes so successfully practised in the south of Scotland! While the present condition of the Highlanders requires some great radical changes to render them more independent and comfortable, it remains with those who have the power, and are willing to exert it, both to devise and apply such remedies as are necessary for the accomplishment of an end so very desirable.

Having thus at some length endeavoured to trace out the most prominent of the *remote* causes which led to the late destitution, the *immediate* causes which led to the same come now to be briefly spoken of. On this part of the subject it is unnecessary to say much, as the causes, from various reports made by Highland clergymen and others regarding them, are already known to all. From the situation and circumstances of the Highlanders, already so fully mentioned, it will easily be perceived, that they are in a condition utterly incapable of enduring without much suffering, even a partial failure in the means whereupon they so scantily subsist. A total failure, therefore, exposes them at once to the ravages of dire famine. To the sad consequences of such a failure, the Great Disposer of all events was pleased to expose them during the currency of the two last seasons. The spring of 1835 was cold and inclement. Sowing was consequently late; and from the wetness of the soil, the seed in many instances was destroyed, and never vegetated. The potatoes were seized by some unaccountable disease, which generally prevented their growth, so that whole fields laid under them appeared with scarcely a plant. Harvest came with torrents of rain, which prevented the crops, which would be otherwise late, from ripening and filling; and after the same were cut down, it was impracticable to secure them in good condition. The straw was deprived of its substance, and could afford little or no nourishment for cattle. Meal was of inferior quality, and exceedingly scarce. Potatoes were the same. The stock of cattle on hand was much larger than usual, owing to the low prices; and while the people themselves might have contrived to subsist without complaint on their diminished store, had they not improvidently kept an extra stock on hand, they were under the necessity of giving the cattle the potatoes and grain on which they should have subsisted themselves; and in many instances they lost their cattle, after expending their all to keep them in life. Never were they in more unfavourable circumstances to meet such a severe spring as that of 1836 turned out to be. Many had little or no seed to put in the ground. Others who contrived to keep potatoes for seed, were afraid to plant them but in small quantities, as they exhibited symptoms of the discase of the former season. Sowing was even later than in the previous spring. The summer and autumn months were unprecedentedly wet, and before either corn or potatoes had attained to any degree of ripeness, they were overtaken by the snow-storm and severe frosts of October. Destitution had even then commenced, and it was heart-rending to witness the manner in which poor families passed the following winter. A similar destitution is not recollected by any now alive. That of 1782 was by no means so severe in the islands, yet "*bliàdhna na peasrach*," or the "pease-meal year," was sufficiently memorable to render it an era from which old Highlanders calculated dates, or made other references. An idea may be formed of the scarcity and extent of the famine in that year, by perusing the following quotation from the recently published "*Memoirs of the Life and Works of the late Right Honourable Sir John Sinclair, Bart.*," a gentleman enthusiastically devoted to the service of his country: "So cold and stormy was the summer of 1782, that the crops were late and unpromising. On the 5th of October, before they had time to ripen, a frost, armed with the rigour of a Greenland climate, desolated in one night the hope of the husbandman. The grain, frost-bitten, immediately contracted a hoary whiteness. Potatoes and turnips, already dwarfish, were further injured. The produce of the garden was destitute of its usual nourishment, and the fields yielded not one-third of an ordinary crop. No wholesome food could be procured, and disease as well as famine began to overspread not only the whole north of Scotland, but even some districts on the south. On this occasion of general distress and alarm, the Member for Caithness earnestly besought the interposition of Parliament." Well-timed relief was in this way procured, "and the whole cost of it was little more than L.15,000, yet no less a number than 111,521 souls, inhabitants of fifteen counties, were rescued from starvation."

Several localities in the north of Scotland suffered considerably from a hurricane of unexampled severity, which took place in the year 1807, and laid waste some of the districts which had availed themselves of the already mentioned Parliamentary grant. No distress of this kind was afterwards felt until the year 1817, which, in consequence of the unfavourable nature of the preceding year, proved to be a season of considerable severity. The case of several districts was represented to Government, and a supply of oats was at once allowed for the benefit of the distressed. From that year down to the two late seasons of destitution, there was happily no great cause of complaint; and what has been already stated in regard to the severity of those seasons, renders any additional remarks on that subject wholly unnecessary.

The remote and immediate causes which led to the late destitution having been already considered with some degree of minuteness, it remains now to treat, 1*st*, of the remedies for the immediate relief of the distressed; and, 2*d*, of the ultimate means to be pursued to prevent (under Providence) the recurrence of similar destitution.

1*st*, As to the remedies for the immediate relief of the distressed, these have been already most effectually applied. No sooner did famine begin to shew itself among the rugged hills and the romantic glens of the Highlands, than the British nation bestirred itself, with laudable promptitude, to arrest the progress of this ghastly assailant of life, and to rescue the dejected Highlanders from falling victims to its merciless assault. The liberality of the English nation in particular, evinced as it has been so forcibly during the currency of the bygone season, surpasses the bounds of admiration and praise. While appeals could be made to no nation more alive to generous impulse, or more ready to give ear to the cry of distress, such appeals were made by a gentleman, than whom the afflicted Highlanders could find none more devoted to their cause,—none possessed of more varied and extensive knowledge of their manners and character as a people,—none imbued with a higher sense of their integrity, loyalty, and many redeeming qualities. Of this people he boldly affirmed, "that there were none in his Majesty's dominions more peaceable, more honest, or more loyal to their king and country." For their benefit he relinquished for a time not only the ordinary duties of the clerical office, but also those high and important duties which devolved upon him as Moderator of the Church of Scotland! Himself a genuine Highlander, it was his delight to call forth his utmost energies in behalf of a people, for whose advancement in moral and religious knowledge he had ever exerted himself with much success. In his tour to England, he was fortunately accompanied by a gentleman, who, though no

Highlander by birth, is, notwithstanding, possessed of Highland characteristics to a high degree,—a gentleman who always displayed a zeal for the Highlander's welfare and improvement, and who went out on this mission of charity at the sacrifice of private interest and secular avocations.

The English nation, always liberal in a good cause, were thus appealed to by the eloquence of these gentlemen, furnished as they were with minute reports from the quarters in distress,—and their appeals, instead of being slighted or overlooked, were immediately responded to by the nation at large. The British capital, aroused by feelings of charity and benevolence, displayed a sympathy which was instantaneously shed abroad, throughout the counties and corners of broad England. The coffers of the wealthy were speedily opened, and thousands, impressed with feelings of brotherly love, came forward, and vied with each other in supplying the means to relieve the distressed, and to pour the elements of life into the almost countless hamlets and cottages of those who were just on the verge of yielding to the fell attack of famine. By means of the benevolent committees, so prudently organized in London, Edinburgh, Glasgow, Aberdeen, and in various other quarters, the local committees in the Highland parishes were furnished with supplies of meal and other necessaries at regular and timely intervals; and these supplies were dealt out with a care and economy, which could neither induce supineness nor inactivity on the part of the distressed, nor even tempt them in the least degree to habits of idleness. It is unnecessary even to attempt to give a picture of the misery and wretchedness which existed in most Highland districts during the late seasons of distress. While the nation in general was so strongly moved and made alive to the amount of suffering which then existed even by feeble accounts of it, the feelings of such as were daily eye-witnesses of the reality may be easier conceived than described. The afflictions of the distressed arose not only from want of food, but, owing to the wetness of the seasons, it was out of their power to secure their wonted supplies of peat or turf for fuel, and therefore, in this respect, they greatly suffered. While they had also no seed fit for sowing, from its damaged condition, they were likewise in this respect most liberally supplied. Besides the quantities awarded to them from the subscription funds, several local proprietors came forward with their private supplies,—amongst whom the Right Honourable Lord Macdonald eminently distinguished himself. That Noble Lord and most indulgent proprietor imported many hundred bolls of excellent oat seed into the different parishes on his estate, which proved an inestimable boon to his tenantry, not only for the present season, but will also do so for years to come.

Now that the Highlanders have been relieved from their late calamity,—that they have been rescued so humanely from the ravages of an impending famine,—may they never forget the great debt of gratitude which they owe to their benefactors in general, but to the English nation in particular, whose generosity, zeal, and humanity, have gained it immortal credit. May they also tender, with heartfelt thankfulness, their grateful acknowledgments to the office-bearers of the London Committee, whose industry, anxiety, and exertions in their behalf, were of no ordinary description. The duties which these honourable gentlemen took upon themselves, without any pecuniary reward, were most laborious and difficult in their nature. Exposed, on the one hand, to the gibings of ignorance and prejudice, and on the other to the hostile invectives of such as were enemies to the cause, their situation was, in consequence, of high responsibility, and such as could only be endured from the firm conviction that they were acting on humane and Christian principles. Yet, though far removed from the localities for whose benefit they toiled, and though no doubt perplexed at times by contradictory intelligence, in reference to the nature and amount of distress, they have now the pleasing reflection that their labours have been attended with a success which reflects upon them the greatest credit,—and that their devotedness and energy in the good cause have gained them the esteem and admiration of every well-principled man.

But while the Highlanders should thus be actuated by feelings of thankfulness, may they ever bear in mind that their numerous benefactors were merely willing instruments in the hands of the Father of Mercies, for the accomplishment of his gracious purposes! To Him let them sing aloud the song of praise and thanksgiving, for having blessed them with a season of unexampled fertility and abundance; and for "crowning the year with his goodness, until the little hills rejoiced on every side, and the valleys covered over with corn, shouted with joy. They who sowed in tears have reaped in joy. He that went forth and wept, bearing precious seed, came again rejoicing, bringing with him his 'heavy' sheaves."

2d, The ultimate means to be pursued to prevent (under Providence) the recurrence of similar destitution, now remain to be taken deliberately into consideration. From the various causes already more or less alluded to, which led to the late distress, one striking corollary seems to be clearly and fairly deducible; and that is, that the recurrence of similar distress can only be guarded against, and the real condition of the people permanently ameliorated, by an extensive and well-regulated emigration. To any one who has considered with some degree of attention the various circumstances connected with the Highlands, in as far as regard the comforts, the means, and the capacities of the people, it must be sufficiently apparent, that the precarious nature of their means of livelihood, and their liability to become the victims of such appalling visitations as the late calamity, take their origin entirely from an excess of population. Let that excess, therefore, be done away with, either by a judicious interference on the part of Government, or by the application of means otherwise provided, until the population be reduced to a wieldy community, and thus rendered fit subjects for a variety of subsequent improvements. It is humbly suggested that this desirable end can only be effected by emigration, at an expense foreign to the people themselves; for if left to be accomplished by such as are otherwise fit subjects for it, the consequence will be, that it never will take place. Whatever might have been done in the way of voluntary emigration, at their own expense, some years ago, such is now quite impracticable. Should they have the will they want the means, in consequence of a series of adverse seasons. Granting even that a few families were to leave each parish in this way, it is a palpable fact that, by so doing, no relief whatever would be giv the country under the present system of management. new aspirants otherwise unprovided for, or such as rem in a single state, for an opportunity to get "helps me them," would immediately grasp at the deserted posses and would speedily multiply to a degree incompatible wi means of support afforded from their new possessions. emigration, therefore, must be resorted to on an ext scale, new modes of management must necessarily be ad to prevent in future the wonted evils arising from an accumulating population.

It is true that emigration has been already carried on certain extent from the Western Isles, in course of last mer, but that was done under a most erroneous system, should be carefully avoided in future. The emigrants selected with care, and were restricted to certain ages, b which none would on any account be taken. Intended, doubt this system was, for the benefit of the country, t fects of it tended only to increase the evils which Gover was anxious to alleviate. Were it to be continued un population would be reduced to that degree which ci stances so loudly call for, every Highland district and would be left peopled with a helpless group of aged me women, afflicted for the loss of their friends, and unable years and infirmity, to provide themselves with those saries of life, which were wont to be furnished, in whole part, by their dutiful sons and daughters, then banish ever from their view. But should this system be att with no such effects, it is characterized by a degree of c (which was undoubtedly unforeseen by the promoters of i intended every thing for the best), which renders it re to the nicer feelings of a civilized public! It breaks the most endearing ties of relationship, and with a fiat as peremptory as that of death itself, it separates for ev aged parents from their tender offspring. It depriv country of its strength and of its working population, though most advantageous to the land of the emigrant's tion, it becomes ruinous to the land of his nativity. N is wanting to render the system both good and effecti that, instead of making breaches in families, by selecting from among them the young and able-bodied members as emigrants, the said families be removed *en masse* to the colony intended for them. The Highlanders, like all others brought up amid the romantic scenery of towering hills, expansive plains, and placid lakes, are a most patriotic race of people. To whatever clime they go, they ever cherish in hallowed remembrance their dear old mother-country, and still would fondly call it "home." A people, therefore, possessed of such feelings, should be gently dealt with, and weaned away from the land of their birth by means founded on humane and patriotic principles, otherwise they will take a dislike at the most prudently devised schemes for their ultimate good. Many of the parting scenes, rendered doubly distressing by the nature of the system lately acted upon, were enough to make the poor people shudder at the very name of emigration, and to cause them to live contentedly in poverty on their native soil, however barren, rather than leave with sorrowful heart their aged friends unprotected behind them.

With considerable accuracy it may be stated, that, by the two emigrant ships which sailed in course of last season (1837) from Skye to Australia, (viz. the "William Nicol" of Glasgow, and the "Mid-Lothian" of Leith), 609 souls were embarked for that distant colony, of whom 203 were under seven years of age. Of this number, 459 souls were from the different parishes in Skye, and the remaining 150 from the adjacent coasts of the mainland. Those who emigrated from Skye left 264 individuals behind them, who were their nearest relatives, and members of the same families, of which number 103 were parents or aged sisters, who are now thrown entirely upon their own resources, having lost their chief stay and support! Besides the two ships now mentioned, a third has sailed since for the same colony from Tobermory, in the island of Mull, having about 320 emigrants on board.

This statement, in reference to the emigrants from Skye, furnishes a proof sufficiently striking, that the mode of emigration thus practised can bestow no benefits, but quite the reverse, on the poor Highlanders. It is, therefore, earnestly suggested, that, in future measures for their relief, an extensive scheme of emigration will be pursued, founded on more beneficial principles. Should emigration take place to any of her Majesty's colonies elsewhere than Australia, say to New Brunswick or Upper Canada, it would be essentially necessary to provide the emigrants, not only with provisions and a free passage, but also with a supply of substantial clothing. The causes which led to the late destitution, affected them not only as to aliment, but likewise as to clothing. From the high price of wool for some years back, and from the smallness of their possessions, having few or no sheep of their own, many are miserably destitute as to the article of bed-clothes and wearing apparel. The people in general seem more inclined to be conveyed to the British colonies in North America than to Australia; and should measures to that effect be condescended upon, they could no doubt be executed at less expense than Australian emigration, even including a liberal supply of clothing for the cold American winters. This predilection for America arises solely from the people's ignorance of Australia. Most of them, until lately, never heard that such a colony existed; and such as did hear, knew it only by the name of Botany Bay, which they considered a wild place, and only suited as a region of punishment for rebels and convicts. All means should be used by such as have influence over them to do away with this prejudice, and to make them acquainted with the climate and natural resources of this excellent colony.

After thus disposing of the surplus population of the country by emigration, local remedies must be effected, and such causes of destitution as over which the people themselves had a direct control, must forthwith be discontinued.

Early and improvident marriages should be discouraged, and eventually checked; not, however, by the enforcement of any positive enactments for that purpose, but by the total removal of such inducements as may directly or indirectly lead to an untimely entrance on the marriage state. For this purpose, the young should be instructed not only in the different branches of useful industry, but likewise in the fields of moral, religious, and scientific knowledge, and that to a degree suited to their various capacities, and calculated for their ultimate good. The diffusion of general knowledge among them would make them think differently of themselves, and would wipe away those traits of improvidence wherewith they are presently characterized. The young Highlanders are frugal, careful, and most kindly disposed; yet, it must be acknowledged, that they are destitute of that ambition or keen desire which should stimulate them to emulation, and thus enable them to see that their condition is less independent than it might be.

For the attainment of the general advantage spoken of, many changes must be brought about, and one local remedy in particular is indispensably necessary, without which all others will be to no purpose; and that is, that, as speedily as possible, the lotting system, or the continued subdivision of lands, must be universally checked, and for ever discontinued. To the small allotments of lands, and to the craze for making them still smaller, are attributable most of the hardships incidental to the Highland population. From this source alone arise the desire and the opportunity for early marriages. From it arises, in consequence, an undue increase of numbers, with a want of means to support them. It proves a total check to every improvement. It gives direct rise to abject poverty, and precludes even a wish for amelioration. It is not enough for securing the ultimate comforts of the people, and for opening a field sufficiently wide for agricultural improvement, that emigration reduce the number of families to an equality with that of the original undivided lots and crofts. These lots and crofts were decidedly too small for the due maintenance of a family, and for enabling that family to live entirely on the profits of their possession, without having recourse to chance employment in distant countries. This only mode of remedying the evils complained of, when once condescended upon, should be acted upon judiciously, but determinately, avoiding at the same time all measures which tend to harass, or to an unnecessary disturbance of the people's peace and happiness.

From the adoption of such beneficial measures, many happy results would necessarily ensue. The rising generation, no longer allured by the shadowy prospects by which they were formerly chained down to poverty, and no more fettered within the bounds of a possession too contracted for their support, would direct their attention to other pursuits, and would engage themselves in the prosecution of those various arts, handicrafts, and professions, which never fail to secure a comfortable livelihood almost anywhere. In this respect a proper subdivision of labour would take place, and would prove advantageous to all parties. Habits of industry would get a new stimulus, and would be practised under a new light. The deeply-rooted improvidence of former times, would give place to a general taste for improvement, from a sense of the numberless comforts which would flow from it. The chances of suffering from such occurrences as the late visitation of Providence, would be infinitely diminished, and the population would at once be raised from a state of indigence and toil, to the happier and more enviable condition of an independent, intelligent, and well-instructed people.

When the lands are once converted, by a local process of enlargement, into shares severally adapted for the maintenance of a single family, every encouragement should be given to improvement, both by draining and fencing that which is presently in some degree arable, as well as by trenching in and reclaiming waste lands. It is known to every one who has made a tour of the Highlands, that vast tracts of land are to be met with in a state of sterility; and without even condescending on the spaces and patches of ground which are presently useless, within the very bounds of their measured lots, immense ranges lie under moss, which are presently looked upon as irreclaimable. It is acknowledged that waste lands of this description occasion considerable expense ere they are reclaimed; and it may be objected that the crofter has no capital, and consequently no means, wherewith to effect such improvement. This objection might be justly pleaded were the crofter under the necessity of converting all his waste ground into arable land within the space of a year or any other limited period. But such need not be the case. Let the work go on gradually, and however small the portion reclaimed in a season may be, the benefits arising from it will prove a more powerful stimulus to proceed with the improvement thus commenced than could be effected by any advices on the subject, however persuasively given.

As limestone is to be found in most Highland districts, every family might make lime for itself, unless the inhabitants of contiguous hamlets would see fit to club together, and manufacture quantities of that most useful commodity for the benefit of their lands. Lime is very little used by the small tenants in the Hebrides as a stimulant, for many indeed are ignorant of its good effect upon the soil. A variety of very important improvements should thus be carried on, all tending to the advantage of landlord and tenant, and thus to the community at large. Those domestic concerns which are at present so grossly mismanaged, would be conducted on more approved and genial principles. By the employment of horses, both men and women would be freed from a degree of slavery, by which they have been so long enthralled, and would be no more subject to grievous and unnatural acts of labour. Creels would give place to cars, and the "căs-chrom," so long an instrument of toil, would be for ever discarded! Works of industry would arise from the due management of their more extensive possessions, which would amply repay the necessary labour in executing them. Thus, annual migrations to distant parts of the kingdom for chance employment would for ever cease! Long, fruitless, and fatiguing journeys, would be discontinued. The natives would become a sort of domesticated community, who would live in comparative ease and comfort on their own resources. Health, happiness, and independence, would spring up in every quarter, and even the appearance of famine in future would become, under the blessing of Heaven, a matter of rare and almost impossible occurrence.

After thus adverting to the benefits which would flow to the people from a reduction of the population, as well as from an improved system of agriculture, one other source of useful and profitable employment remains to be mentioned, which seems to be the only local source to this effect besides husbandry which lies within the reach of the people,—that is, fisheries. It has been already mentioned, that, at one period, the herring appeared in immense shoals in every loch and bay which intersect the Hebridean Isles, and that the natives caught it in large quantities, both for the market and for domestic consumption. But while that fish has deserted its wonted places of resort, it is well ascertained that, in its annual migrations, it passes by in the streams and currents of the deep sea, where the people have neither skill nor materials to catch it. Some years ago, when it abounded in almost every creek, the people had nets and other necessaries for procuring it. Their circumstances then enabled them to provide such things as are now beyond their reach; besides, that the stations which that fish then frequented, enabled them to catch it with far less skill, as well as with less danger and expense, than at the present day. Herring, however, is not the only fish which might, through time, afford the natives lucrative employment. Cod and ling, and endless varieties of lesser fish, frequent the banks and currents of the western seas, which might, through skilful management, turn out of vast advantage to the people. As matters stand at present, the benefit derived from fishing is very limited indeed. With the exception of small quantities, which are caught by such of the natives as are able and inclined in good weather to go a-fishing, for the immediate use of their families, little or nothing is secured for the market in many of the Western Isles. The natives of Lewis Island must, however, be excepted, who are in this respect rather industrious, and catch considerable quantities of cod and ling on the western coast of their island.

The London cod-smacks furnish ample proof that white fish of this description is still abundant in the open channels which surround the northern Hebridean Isles. These vessels are furnished with "wells," into which the fish is put alive, and is brought in that state to the British capital. A certain number of these vessels visit the Lewis coast annually, and supply the London market during the season with considerable quantities of fish in excellent condition. When the London season is over, they are generally engaged for some weeks in supplying the Stornoway fish-curers with the fruits of their industry, giving them the ling for sixpence or so each, and the cod for threepence or fourpence, according to size and quality. It is said that hand-lines are the only tackle made use of by these English fishermen; and that they are possessed of so much skill in their vocation, that a vessel, by leaving Stornoway on Monday morning, and resorting to banks in the deep seas, returns on the following Saturday evening, having almost incredible quantities of fish on board.

About the year 1810, an English fish speculator of the name of Degraves, visited the shores of Orkney and Shetland, and there carried on his traffic with considerable success. The fishermen whom this gentleman employed were Dutch; and it is reported that, had he not ruined his prospects with over-speculation, the undertaking would have proved very successful.

Several years ago, a man from Fraserburgh, in the county of Aberdeen, went to the coasts of South Uist, where, from his skill and perseverance in fishing, he not only benefited himself by his industry, but also the natives of Uist by his example. He had in all four boats and twenty-one men, and his speculation was so successful, that he cured about forty tons of fish during the season.

The greatest fishing now carried on in the Western Isles, besides that by the London vessels already mentioned, is by the Irish, who have frequented for some years back the different banks in the channels between Barrahead, Coll, and Tiree. They are supplied with large Portross wherries, well adapted for the boisterous stations which they make choice of, as well as for carrying the produce of their labours generally to the Irish markets.

While such examples are recorded as to the extent to which fishing might be carried on, as well as to the advantages which might be derived from it, it will be observed that the same has been almost entirely effected by strangers,—while the natives, who so very much require such advantages, are incapacitated, from want both of skill and means, to avail themselves of the benefits which are otherwise within their reach. It becomes a matter of serious consideration *how*, and *when*, they are to be supplied with the means of fishing on a proper system. The question simply comes to be,—whether that should be done under their presently constituted state of society, or whether the same should be deferred until the population be reduced in the manner already suggested?

From the various preparatory steps necessary to establish fisheries on a proper basis, it would appear difficult to accomplish this end under the present accumulated state of population. The very nature of fishing on a scale thus projected, would require the young to be trained to it from boyhood upwards, and, by looking upon it as their sole occupation, to bestow upon it their undivided attention. But from what has been already stated as to their present circumstances, such would be almost an impossibility.

It is incompatible with the vocation of a fisherman, that he pass one-half of the year either at labour in the south country, or toiling at the cultivation of a few acres of ground at home. That vocation, if properly managed, requires all his energies and attention. Experience, conjoined with a knowledge of seamanship, are indispensable to secure success to the fisherman. The most rational way, therefore, though undoubtedly the most protracted to get it accomplished, for securing lasting benefits to the islanders, appears to be, that, after lands are portioned out in proper allotments to such as will live solely by them, at least a part of the surplus of the rising generation be trained to fishing, and be encouraged to prosecute it for their own benefit as well as for that of the country at large.

Even under their present modes of fishing, considerable good would result from a temporary supply being awarded them of long lines, hooks, &c. Many might benefit their families by occasional supplies of fish, who cannot avail themselves of the same in the mean time, merely for want of such tackle as is used in the place. But for permanent advantage from this source of industry, it is necessary to supply them, not only with fishing materials on approved principles, but also with skilful men to instruct them in the art, to superintend the work, and to arouse their emulation and industry by their example.

Among the various requisites to establish fisheries on this scale, are harbours, quays, and store-houses. These should be as numerous as possible, at the same time taking care that they be erected at stations judiciously chosen. Without them, the occupation of the fisherman can never be carried on with regularity or equable success. The next requisite is boats, or wood and iron to make them. The boats suited for the white-fishing should be from sixteen to eighteen feet of keel, or even larger, while the kind for the herring-fishing should be larger still, resembling those used at Fraserburgh, Peterhead, or Banff. As to the tackle for cod and ling fishing, every boat would require cordage, commonly called long-lines, to rig out 600 hooks, with buoy-strings in proportion. Every herring-boat should be supplied with five or six barrels of herring-nets. Each boat would require an experienced fisherman, at least for a time, as instructor, and perhaps none are better suited for this purpose than fishermen from Peterhead, and other places on the east coast of Scotland. Some are of opinion that, were fisheries thus established, it would be necessary to have a general inspector over those of every island, such as Skye, Lewis, Uist, &c., for the purpose of superintending the work generally, as well as for seeing that order and industry prevailed at every station.

Before such extensive arrangements as have been thus pointed out, can possibly be brought about, several years must necessarily elapse, during which the people will be as liable as ever to be overtaken by the sad consequences of inclement seasons, should it be the will of Divine Providence that such will come to pass. It is therefore earnestly to be hoped, that, from whatever quarter relief is to be obtained for the permanent benefit of the Highlanders, by the adoption of such arrangements as are both judicious and necessary for that purpose, the same will be speedily applied. Though the late cry for bread has been heard, and humanely responded to, by a liberal and benevolent nation,—and though the Divine Bestower of " every good and perfect gift" has been graciously pleased to crown the year with abundance, and to shed abroad His blessings, with bountiful hand, throughout the regions of distress, yet it is not enough to rest satisfied under these circumstances, or to view the future condition of the late sufferers with lukewarm indifference. The fact that they have been mercifully rescued from the late calamity, and that they are still, from local peculiarities, more liable than the rest of the nation to similar calamities in future, renders their case worthy of deliberate consideration, by all such as have the power to accomplish measures of improvement.

The London Committee, after having fulfilled their arduous duties in the most satisfactory manner possible, have still a sum of nearly L.12,000 Sterling in their hands, which will, of course, be laid out in some shape for the benefit of the Highlands and Islands of Scotland. It becomes a question of considerable difficulty and importance how that sum should be expended, so as to gain, on the one hand, the approbation of the benevolent donors, and, on the other, to contribute in the most judicious way to the welfare of the objects of their charity. That sum, though of very considerable amount, would go but a short way in accomplishing the various ends suggested in this paper, for the permanent benefit of the Highlanders; and it is the opinion of many, that it would be deviating too far from the charitable object at first held in view, to apply it for that purpose. Among the various modes which may be thought upon for the application of this residue, the following is humbly suggested,—that it should be awarded to the poorest of the Highland parishes, in such portions as would be condescended upon, for the purpose of forming a fund in each of the said parishes for the benefit of paupers. In many of the Highland parishes, the church collections for the poor do not amount to L.3 Sterling annually, and, from their smallness, they cannot be distributed among paupers, amounting to sixty or seventy in number, but once in the two years. Yet this small sum, which can be given in no larger shares to most than one and sixpence each, is very thankfully received. Were there a parochial fund of L.100 or L.200 Sterling, the interest of that money would be of permanent advantage to this most helpless class of the community; but this is not all, the very existence of such a fund in each parish, would be the means of increasing itself through time, as the charitable would contribute to it, and small bequests and legacies would at times be left it, which would never be thought of, nor indeed could be, until such a fund existed.

While the population of the districts lately visited with distress is so very large, it may happen that even the means of relief already mentioned may fail in some cases of having the desired effect. Amidst so extensive a community, several will no doubt be actuated by various inclinations. Of those who may be fit subjects for emigration, some may be willing to avail themselves of it, and some may not. Some may have a wish to engage in the different departments of industry at home, while others may not feel so inclined. It is therefore desirable that the promoters of the Highlanders' welfare should, in a sense, endeavour to be "all things to all men,"—and thus render the means of relief as various as may be consistent with prudence and judicious arrangement.

It is well known that the Higlanders have always been a brave and warlike race of people,—and though their spirit has no doubt suffered considerably of late, through adversity in various forms, yet their characteristic valour, if called forth, would still be an honour to their name and to their country. It were therefore to be regretted, that such of them should be banished to foreign climes, as might be useful and willing for the service of their Queen and country. To part with brave soldiers, if required as such, would be parting with so much of the national strength. Might not service in her Majesty's forces be offered to such Highlanders as are inclined to accept of it, in preference to other employments? Might it not be consistent with expediency to raise a "New Regiment of the Isles," and to give the Highlanders another opportunity of distinguishing themselves in the field of honour, as the descendants of brave and dauntless heroes? Let their deeds, in former times, be for a moment called to recollection,—deeds by which the mighty fell, and by which the fame of the victors shall live for ever in the annals of history.

As a specimen of their bravery, some of the brilliant achievements of the Black Watch may be called to remembrance, as they were the first Highland corps called to the service of their king and country. This regiment was at first made up of men who held a distinguished rank in society,—young chieftains, cadets of principal families, and gentlemen's sons. When garbed in their sombre tartan, and armed with their broadswords, pistols, and dirks, they formed a beautiful contrast with the dazzling scarlet dress of other regiments. As this celebrated body was composed of brave and spirited men, it might be expected that their deeds of valour would be g and glorious! Their gallantry shone forth in brilliant co] at the battle of Fontenoy, fought on the 11th May 1 This was the first opportunity they had of meeting foeme the open field of strife. But the most deadly scene in w they were ever engaged was the siege of Ticonderago, ir United States of North America, on the 7th July 1750. this desperate and sanguinary struggle, a part of them rus with more gallantry than prudence, through the barric and breastworks of the fort, and plunged with a fearful ch among the enemy, against whose deadly fire they had p ously stood for hours. The affair covered the survivors laurels which shall never wither,—laurels which shall while valorous deeds continue to be recorded in history. their bravery and loyalty on this memorable day excited admiration of the world, their Sovereign was pleased to ho them with the name of "Royal." They subsequently di guished themselves in a manner equally brave in the Wes dies, and in various other quarters. In the celebrated ex tion to Egypt under Sir Ralph Abercromby, this gallant c as well as other Highland regiments, fought with most h courage. Aboukir Bay and Alexandria will ever testi Highland bravery. In those places evolutions were exec and charges made, which no human power could resist, the enemy only stood before the magnanimous sons of S like chaff before the wind.

It were needless to recount the various battles in w these noble soldiers had an honourable share during the ninsular war. Let Wellington, that renowned "hero hundred battles," bear evidence to the manly conduct an lorous exploits of the Highlanders! General Lord Hill, humane nobleman, will also feel pleasure in calling to r lection the bravery of the 79th and 92d Highlanders, in various campaigns abroad. At Vittoria, the Pyrenees, Or Toulouse, and in various other deadly skirmishes, how r did they acquit themselves under the command of that l General! Perhaps there was no General to whom the H landers were more devotedly attached than to Lord Even in active service they looked upon him as their "Fat and were wont to call him by that endearing name. Such proofs of genuine respect must be a pleasing source of comfort to that gallant commander, and cannot fail to be one of his most agreeable reminiscences.

Under the choicest generalship, the Highlanders thus fought bravely for the freedom of that land which gave them birth. The cause of justice, liberty, and truth, was then at stake; and though some deemed it infatuation even to oppose the formidable legions of the enemy, yet the best of soldiers, under the best of Generals, rushed into the struggle, fierce as the storm of their native hills, and swift as the eagles of heaven flying over their crags and mountains. Thus they obtained the victory.

On the plains of Waterloo, the Highlanders acquired the consummation of that fame which had hitherto been so deservedly great. It is said that Napoleon himself could not refrain from expressing his admiration of these brave and warlike men. The stakes to be decided by the fate of that memorable day were in their nature most important. The glory and pride of the French nation on one side,—and, on the other, the patriotism, the liberty, and the glory of Great Britain! For a time the conflict was desperate and deadly. In every quarter the hardy race of Caledonia did fearful havoc amid the hostile ranks! No barrier could then oppose them! No foe could then withstand them, fighting for their liberty and their country! On that eventful day, the two greatest Generals which the world could produce stood mutually opposed, but the deeds on which the sun went down might well cause the immortal Wellington to exclaim, in the words of the Latin bard,

> "Exegi monumentum ære perennius."

Seeing that, in course of the bygone century, the four quarters of the world testify the bravery of the Highlanders as warriors, it cannot be supposed that any unfavourable circumstances in their condition have as yet damped their native spirit of heroism, or softened them down to diffidence in defence of their liberties, their country, and their Queen. That they have in general multiplied to a degree incompatible with the natural resources of support from their possessions, has been already explained. That improvements should be effected, and that emigration should be resorted to, has also been mentioned. But let it be considered, that, in the event of men being required to serve their country, and protect the Colonies attached to it, every Highlander who may volunteer himself for that service, will diminish the population of his parish or district as effectually, as though he were conveyed at the expense of Government to Australia or North America. It is therefore humbly, but earnestly, suggested, that this source of relief to the country be added to the rest,—and, amid a variety of such resources, let the Highlander avail himself of that which he deems most suited to his inclination and circumstances.

In bringing these remarks to a conclusion, one other remedy, although already slightly alluded to, remains to be more particularly mentioned, and that is a more extended system of Education and Religious Instruction. It is to be hoped that every one will acknowledge the importance of education, as the best security for general happiness, public tranquillity, and permanent improvement. Some, eminently distinguished for piety and erudition, maintain that the permanent improvement of the poor and working classes, can originate only in the diffusion of salutary education and useful knowledge, and that it is unavailing to look for any such improvement from emigration, or any legislative enactments whatever, framed for that purpose.

While the superior importance of education is freely admitted, and the hope fondly cherished that it may soon become more generally diffused,—it is thought at the same time, with all due deference and respect to the learned men who maintain the reverse, that the theory that education is the "one thing needful," cannot hold good. That it greatly tends to improve the condition of society is at once acknowledged,—yet many circumstances powerfully influence that condition exclusive of education. Unless the condition and habits of the Highlanders be improved by some salutary changes in the external circumstances under which they are placed, it seems to be questionable *how* or *when* the same could be accomplished by education alone. The changes which pave the way to this desirable end have been already discussed. While such changes may be in contemplation, and may soon become to be in progress, let them by all means be accompanied with a more extended system of moral and religious instruction. It is of the highest moment, both with a view to the genuine comforts of the people, to the benefit of the community at large, as well as to the peaceable government of the country, that the great mass of the population should be well educated. The blessings of education would cast a new light around, by which appearances would be distinguished from realities,—and, by the increase of moral culture flowing therefrom, both temporal and spiritual affairs would be founded on proper principles.

Though the parishes in Scotland have each at least one parochial school, yet the field is too extensive for this most useful system of education, as presently constituted. Though the General Assembly of the Church have, with laudable zeal, brought nearly one hundred additional schools into operation, on which between seven and eight thousand pupils are wholly dependent for education,—and though the "Society in Scotland for propagating Christian knowledge" have, for upwards of a century back, supported schools, and appointed preachers of the Gospel in a number of localities, yet there is still a woeful deficiency in the means of instruction. The Highlands and Islands are in this respect so ill provided still, that upwards of *eighty thousand* of their population are at the present day unable to read or write! To afford the young free access to the means of instruction, no fewer than four hundred additional schools would be required.

But the deficiency of means for raising the Highlanders in the scale of useful knowledge, consists not only in the want of schools, but also in the deficiency of pastoral superintendence. The Highlanders, strongly attached to Establishments, and firmly bound to that National Church for which Scotland formerly made such a bold stand, have a claim upon the Government of the country for more extended means of pastoral superintendence. Almost every Highland parish requires one or more additional churches,—for, presently, many have to make distances of from five to twenty miles to places of worship, and that not unfrequently over stormy lakes, rapid rivers, and rugged mountains. It invariably happens that the greater the destitution in the means of religious instruction may be—quite unlike the destitution in the necessaries of life—the less will be the desire for relief! Endowments for additional schools and churchés, therefore, would bring about a lasting and desirable reformation in the Highlands, not only in temporal affairs, but also in the knowledge of that divine and blessed Revelation which " brings life and immortality clearly to light."

[*Note by the Editor.*—No one at all acquainted with the present condition of the agricultural population of Ireland, but must have been struck with the exact similarity of their condition with that of the Highlanders, when perusing the foregoing clear and truthful statements of Mr M'Gregor. The evils arising from excess of population, improvident marriages, landsplitting, and bad husbandry in the Highlands may easily find a resemblance in Ireland. But the condition of the Irish cottiers has been much ameliorated, and the evils complained of are gradually disappearing, under the system of managing small farms adopted by Mr Blacker of Armagh, on all the estates of which he has the charge. It is not for a moment to be doubted that the same system would produce similar effects on the condition of the Highland cottar if it were adopted on the estates in the Highlands and Islands by the proprietors and their factors. The system itself is exceedingly simple, may be adopted under any circumstances of tenure, and is clearly and fully explained by Mr Blacker in a pamphlet on small farms, which he issued a few years ago, and a recent edition of which, being the fifth, and a large one, may be found in any of the booksellers' shops in Edinburgh. To this small and cheap, but really valuable work, we earnestly direct the serious attention of every proprietor and factor in the Highlands and Islands of Scotland, who desires the removal of the great evils so eloquently deprecated by Mr M'Gregor, and for the permanent removal of which emigration will always be found to be but a very temporary expedient.]

ON THE AGRICULTURE OF THE COUNTY OF ROSCOMMON, IN IRELAND.

This county, which is in the province of Connaught, and was formed into a distinct shire in Queen Elizabeth's reign, is the most central portion of Ireland. According to the ordnance survey it contains 609,405 statute acres, of which 453,555 are cultivated, 131,063 uncultivated mountain and bog, and 24,787 under water. About two-thirds of the boundaries are defined by water. The Shannon flows along the whole eastern range from north to south, and the Suek runs for a considerable distance on the west limits to the southern extremity, where it unites with the Shannon. The length is sixty English miles, and the breadth varies from thirty-two to thirty-three miles.

We shall give a sketch of each of the baronies and half baronies (of which there are six) according to their geographical arrangement by Mr Weld, in the statistical survey of the county, " drawn up under the directions of the Royal Dublin Society," and written with equal ability and faithfulness.

The Barony of Boyle—the most northern—extends thirty-three English miles, and is remarkably diversified in its surface and productions. The Curlew mountains, bordering on Sligo, and the coal district adjacent to Lough Allen, on the north-west extremity, form a striking contrast to rich plains and beautiful demesnes ; bogs, mountains, flats frequently overflowed by water, splendid buildings, miserable huts, neat cottages, wastes, and woodland, improved estates, and neglected farms, comfort, and misery, are traceable in this single division of the county, in miniature representation of the world of which it forms a unit.

Lord Lorton is a principal proprietor in this barony, and his lordship's property stands prominent in improvement, yet the town which bears the name of the barony, and is divided into two parts by the river (Boyle, also), is in the suburban parts on the northern side extremely miserable, and forms a distressing contrast with the new and excellent buildings, in what may be called the New Town, on the south side of the river, with which it is connected by a new and very handsome bridge. The number of *thatched* houses, with little or no support from falling rafters, is very unequivocal testimony of a pauper population, and discreditable to the county in which they are allowed to remain as human habitations. Yet Boyle is not without a good deal of intercourse with Sligo, to which there is an admirable road, and Dublin by means of the Shannon navigation, or the mail-coach road. New shops are every year establishing in the New Town, and some of them are of an excellent description, and the principal inn is really unexceptionable. Lord Lorton gives encouraging leases.

Mr Weld, whose means of acquiring minute information were superior to ours, states that a great part of the town of Boyle is held by lease against the noble proprietor. This circumstance accounts for the wretched and filthy condition of so large a portion of the town. Mr Weld very judiciously observes, that "in granting long building leases, a landlord, who is anxious either for the good appearance of his town, or for the general improvement of his property, can scarcely be too strict as to the covenants which are introduced relative to the size and construction of the houses and the *alignement* of the streets." And he adds, after a reference to an outlet of Dublin, "how different are matters arranged in and about Edinburgh. There single lots are not leased until a general plan is digested for the improvement of the whole. The houses to be built must all be conformable to the uniform plan; one street is allotted to buildings of a superior description, another to the lesser and inferior, hence every thing appears in its proper place, and a beautiful city is the result of the combination." The towns in Connaught, generally, are dirty and indicative of the degraded state of a large proportion of the inhabitants, and until a spirit of ardent improvement shall be infused into the proprietors, and the old leases and involved interests shall have expired, which in many instances obstruct the advance of civilization, we shall in vain look for those changes in the lowest order of the people of Ireland, which their British friends with such sincerity desire for them.

Lord Lorton has our unqualified respect; he is *really* a patriot, and makes every effort to promote the happiness and ameliorate the condition of his tenantry; but much yet remains to be done.

Rockingham is his residence, and this is magnificent and picturesque in the highest degree. The house or castle, for such it partly is, stands upon the eastern side of Lough Key, which is about three miles in length and breadth, but with irregular shores, forming, with the islands interspersed, on some of which are the picturesque remains of monastic edifices, a very lovely landscape, not the less interesting from having in its vicinity schools and whitewashed cottages—very different from the hovels which are huddled together in other places where turf and the prospect of potatoes invite the starving squatter.

In a publication of this nature a description of Lord Lorton's splendid house (the front of which is entirely of unpolished marble) would be misplaced, but we may notice in perfect keeping with our general subjects, the modes by which turf, the inexhaustible fuel of the district under consideration, is conveyed to the castle, and the danger arising from fire is considerably diminished.

" The supply of fuel to the house here consisting for the chief part of turf, was admirably managed. By means of a canal and lock for facilitating access to the bog, the turf was at once put on board a large boat and conveyed to the mouth of the subterranean passage on the borders of the lake; hence it was wheeled to a magazine-room in the basement storey, communicating with a perpendicular square shaft or trunk, where, by means of machinery, a box containing the turf, and made to fit the shaft, could be raised up to each storey, and so delivered into store-rooms appropriated to the purpose of receiving it.

" Water was likewise diffused in the greatest abundance through every part of the house from the lake, brought in along the same subterranean way.

" An arrangement here relative to the chimneys in case of accidents from fire, struck me as excellent. Each funnel was numbered with large figures on the outside above the roof; and at the side of the door leading out thereon was suspended a wooden tablet with corresponding numbers, and a reference to the room to which each flue belonged. Thus, if a chimney chanced to take fire, it might be instantly ascertained by stepping out upon the roof to what room it belonged; or, on the other hand, if fire was discovered in the room, the flue could be singled out above, and the necessary measures taken to prevent further mischief."

Adjoining properties are much and shamefully neglected, though the facilities of improvement are obviously at hand.

The same may be said of Connaught in general. The landowners have never been *infected* with the *virus* of improvement *mania*, whatever other mad pursuits may have entered into their heads, and many of the absentees appear as if they neither wished to see nor know any thing of their Irish land property beyond the agent's half-yearly statement of its proceeds. Instances of industry and enterprise are lamentably rare; there are some noble exceptions, but only sufficient in number to confirm the general truth, that the landowners of the soil are indifferent to agricultural melioration, and the moral condition of their tenantry. It is hard to conceive how the peasantry of the west of Ireland exist at all; they fix themselves in wretched hovels without chimneys or windows by the bog side, certain of having the comfort of a good fire, in the absence of warm clothing, and if they can obtain an acre or two of indifferent soil for potatoes, they consider their wives and children well established in the world, while they themselves, with a few pence in their pockets, to purchase oatmeal on their journey, carry their limbs (hibernice) to Liverpool or Glasgow in search of temporary wages. With their hard earnings they return to their homes for winter quarters, happy if they have brought with them the means of paying high rents, and of obtaining subsistence until the migratory period shall return. The Connaught labourers, who are of small stature but with hardy frames, are those who principally supply the English labour market during the harvest season, and a miserable sample they are of the population of their country. Roscommon furnishes its quota, though comparatively with the county of Mayo, and of certain other *highly favoured* districts, where the wages of able-bodied men are but 6d. a-day, moderate in amount. It would be well (after witnessing in Great Britain, what to them must be wondrous examples of management both in the field and the cottage) if these creatures of passage derived knowledge and habits of improving industry to be applied at *home* on their return; but they come back precisely the same animals as before; amazed but uninstructed, and, it may be, blind to matters which ought to have been objects of inquiry and imitation, or if quicksighted enough to perceive them, obstinately prejudiced against them, because of their novelty.

The exceptions to this stupidity are very rare, and only likely to occur in the case of *very young* men going to the shores of Great Britain, and possessing some smattering at least of education and habits of decency and self-respect.

Dr Whitley Stokes, Lecturer on Natural Philosophy in the University of Dublin, has recorded an interesting fact, in his essay on the Resources and Population of Ireland, regarding one of those Irish emigrants *pro tem*.

> "A farmer of twenty-three years of age gave me the following account of his progress in life:—He married pennyless at eighteen, worked as a day labourer, his wife spun: he went for one season to England, from whence he brought home, clear of expense, twenty-one pounds, and returned home in time for the potato-digging. He travelled to Connaught for flax which he sold in Kilkenny—he gave long credit and made cent. per cent. profit. In three years after his marriage he had saved sixty pounds. He took a farm, and when I conversed with him two years later, I understood it was well stocked. So easy was it thirty years ago for an Irish peasant, if sober and industrious, to establish himself in the world."

If there be any truth in the observation of some old statistical writer, whose name we have forgotten, that the defective condition of Connaught (viewed in an agricultural point of view) is attributable to the laziness of the labourers, we are charitably disposed to make great allowances for the apparently indolent habits of men, who, at best, can earn but a few pence for a day's work, and are forcibly reminded of the admirable expression of Campbell, in his Strictures on Irish History,—

> "No nation ever yet became industrious, till the prospect of reward had sweetened the exercise of the spade, the hammer, or the hatchet. The feelings of the present ill, for such is toil, must be overbalanced by the hope of future good, else no man will work."

But to proceed with our Barony.—The Curlew Mountains, which are on the western limit of the county, on the confines of Sligo, and at a short distance from the demesne of Rockingham and the town of Boyle, present a cheerful appearance. On their summit is a plantation made by Lord Lorton, which has an excellent effect, especially from his own house. The holdings on the hill-side are all small, from eight to fifteen or sixteen acres. There is, however, a deficiency of trees and hedges around the white cottages which are dotted over the side of the sloping surface; and this want is unaccountable—

if pains have been taken to induce planting—in a situation sheltered from the Atlantic blasts. These hills or mountains are of sandstone, but with beds of limestone, especially on the summit, and they abound with bogs, affording the means of calcining the limestone on the spot,—a point of great moment in any case, but especially so in an elevated region, to which the cartage of lime or other manure from the lowlands would be attended with great expense and difficulty. The rents of these small holdings are stated by Mr Weld to average at 10s. per acre, which is very moderate, where fuel and limestone can be had for the trouble of raising them. The sandstone soil, however, is naturally poor, and in many places covered with heath; but this and shallow bog are easily rendered productive of oats, potatoes, and grass. The rents in the plains about Boyle vary from 25s. to 35s., which we must admit to be very low, considering the excellent nature of the soil, and the convenience of having fuel at the door. Town parks are let for about L.3 per acre.

The ordinary routine of mountain culture is pursued on the Curlew Mountains. Potatoes and oats alternately on the tillage allotments. Young cattle are reared on the rough pastures, and milch cows also are kept in considerable numbers, to supply the domestic wants, and the demands of the town of Boyle.

The practice of subscribing for the purchase of a young horse in spring, to execute the rude labour of their respective farms, is not unfrequent among the families living on these mountains; and there is generally some profit in the matter, the *training* of the animals for draught being always accomplished by the joint owners, before they dispose of him, after their own work has been completed. There are roads to the Sligo side, across these mountains, with tolerably good *public-houses* on the line. The crest of the ridge is narrow and soon traversed, and, on each side of the summit, the view of loughs and plantations is interesting.

There are other small lakes besides Lough Key in the barony of Boyle, and, not including those which form the continuation of the Shannon on the eastern limit, Castle Tennison, on the margin of Lough Meelagh, has a great deal of planted timber about it, with a considerable extent of wood of spontaneous growth. Mr Lloyd and Mr Barton possess much property here; the latter became the purchaser (at the cost of L.66,000), some years ago, of the Coote Hall estate, which would evince more improvement, if an outstanding lease had not unfortunately interposed an obstacle to the operations of the new possessor. Part of this property has been reclaimed from inundation, and a very worthless condition in consequence, by opening a passage to the Shannon for the confined bog-waters. The outlay has produced the most beneficial results to the owner, in the increased fertility of the land, and afforded an example of enterprise which may stimulate some of the many small proprietors in the vicinity to similar industry. The conduct of Mr Barton, in other particulars, respecting his conduct as a landlord, has been also judicious and exemplary. He has removed the lawless and vicious portion of the old occupiers, and retained those tenants who, by their *character*, merited his protection; built stone and slated houses, or *aided* the tenants in doing so, and totally changed the aspect and real state of much of the property so happily transferred to his hands, in the vicinity of Battlebridge, a village on the banks of the Shannon, in which lawless and idle habits have given place to domestic thrift and rural economy of a better kind. The culture and domestic manufacture of flax, and the spinning and weaving of wool into coarse flannels (though the earnings are lamentably disproportioned to the labour bestowed, and the confinement of the operatives at the spinning-wheel and the loom), testify the industrious character of the present inhabitants. In nine-tenths of the whole province, we believe that the wages of labour are painfully insignificant. The following case, related by Mr Weld, is, we fear, of ordinary occurrence.

"A very intelligent stout man, of middle age, whom I found amidst a group, gave me the following information, which agreed very nearly with what I derived from other sources.

"Turf, for sale at the bogs, is heaped up into single and double clamps. The price of the double clamp, 4s. Six double clamps will suffice for one cabin fire for the year; thus, the annual cost of fuel to the cottager amounts to

24s. A double clamp would afford loading for four one-horse cars provided with cribs; but it must be a good horse to draw such a load. It would be a safe course to divide the double clamp into five loads. The hire of a horse and car for the day was estimated at 2s. 6d. The hire of a labourer by the day, on casual employment, 8d. To carry home a double clamp of turf, on a cleave, upon his own back, was to take this man three weeks at the very least. Thus, supposing the distance three miles, and two turns in each day, the whole journey to and fro, from his house to the bog, would be twelve Irish miles, somewhat more than fifteen English miles, which might be considered full and rather hard work for the day, and very indifferently paid for at 8d. But if this labour be compared with the work which could be performed with a car and horse, it will be found to be of still less value than 8d. a-day. Thus, supposing that the horse and car could take two turns in the day as well as the man, and that the double clamp could afford loading for five horses and cars; it would then require two days and a half work for one horse and car, which, at 2s. 6d. per day, would amount to 6s. 3d.; so that here was this man walking fifteen English miles a-day for three weeks, or, Sundays excepted, for eighteen days, to earn equal to 6s. 3d. in horse hire, in other words, earning just 4¼d. per day. I noted down in my pocket-book the account as the man gave it; and having summed it up, and pointed out, that, if he could earn 8d. by other labour, he was a loser by not hiring a horse; he coolly replied, that he was quite aware of the difference, but that the employment at 8d. was rare to be had, whilst by carrying turf, he was certain of earning something every day."

The surface of the northern division of this barony is much varied; insulated hills with roads in the old way up and down, flats and bogs interspersed, meet the eye. From one of the elevations, Mount Prospect, the demesne of Rockingham, with its lake and woodland beauties, is plainly visible; but when the spectator turns to the northern extremity, the view of trees and hedges is changed for that of rudely constructed stone-walls, and other unseemly fences, with here and there, on the road-side, an improved kind of habitation. In the vicinity of Crosna, the property of Colonel Tennison, the soil, which is of sandstone, is partially subjected to the process of irrigation, and the pasture land where it is practised rendered productive in consequence.

On the borders of Lough Allen, and at the northern extremity, are the coal mountains, and here there is neither fertility nor rural improvement of any kind. Much money and much labour, with various results, have been expended on the Arigna *Iron-works*, which, with the collieries, are principally in the parish of Kilronan, and along the course of the river Arigna.

Unfortunately, those works have been sometimes conducted (not always by the same company) on very extravagant principles, and have occasioned a great loss to a benevolent and patriotic land-proprietor, who advanced vast sums to keep them going. They now yield largely, and give employment to between five and six hundred men.

On proceeding southwards to Lough Gara, the traveller finds the soil very light and indifferent, and the same absence of plantations and hedge-rows, except those surrounding a few gentlemen's houses, which is so apparent elsewhere.

The mail-coach road from Dublin to Sligo bisects this large barony into the northern and southern divisons; of which the latter, traversed by roads branching from Boyle, remains to be briefly noticed.

The small village of Croghan, which belongs to Mr Guy Lloyd, an English gentleman, who possesses property also in his native country, indicates, by its thriving and neat condition, that it is under the superintending care of a benevolent and judicious landlord. Mr Lloyd is one of the most respected and beloved landowners in the county. Limestone and limestone-gravel (which, if *applied*, would reclaim all the bogs in the county) abound throughout this part of Roscommon, and there are more trees here than in the northern division.

French Park, the demesne of a family which has long represented the county in parliament, is rich and highly cultivated; but the town of the same name, and belonging to Mr French also, is of the genuine Connaught description; two-thirds of the houses at least being badly thatched, and of irregular dimensions. There is not a sufficient number of good and well slated houses to remove the impression that poverty and nastiness have their abode here. The noble demesne contains 1450 statute acres, and exhibits the evidences of much improved husbandry. The drill system is practised to a very fair extent. In the immediate neighbourhood there is a tract of more than 2000 acres devoted to the pasturage of sheep, which are partly of the Leicester breed, and of a heavy weight. Mr French keeps the sires of all kinds of stock for the use of his tenantry, His rams are often hired out for the season at L.25 and L.30.

The land in this neighbourhood is exceedingly rich, and, as is the general practice in Roscommon, where the natural pasture is so excellent, appropriated almost exclusively to the fattening of heavy cattle ranging at large. Mr Wakefield reports of French Park in 1809, that the crops of hay were remarkably heavy, and relates an anecdote to prove that eight tons had been saved on a single acre; but, as Mr Weld observes, "it is not explained on what description of ground the hay was produced. The flat lands in the vicinity of the Breeogue, and other sleepy rivers in this neighbourhood, which commonly overflow, produce immense crops; but the grass is of a coarse description, as usual in such places." The same interesting writer tells us, on the authority of Mr Wakefield, that, at the same period, Mr French was hiring from his own tenants land (which had been let to them on long leases by his father at 10s. and 15s. per acre) at two guineas per acre; and that in a particular case, when he was refused a renewal of 400 acres from an individual tenant on the terms just stated, he determined to make the most of his bargain during the concluding years of his occupancy, and actually derived from the broken lea the following crops in succession, without manure unquestionably—potatoes, *twice*; flax; and then six crops of oats! Now, unless there had been some very peculiar circumstances in the case, we think that this extreme exhaustion of the land was neither judicious on the part of Mr French in his character of principal landlord, nor very creditable in that of tenant *pro tempore*. The example to the tenantry upon his estate was a bad one, as it is to be assumed that the tenant to whom the landlord had become sub-tenant during war prices was not under any moral or other obligation to give up the enjoyment of his farm beyond the stipulated period of tenure. The land which could bear such scourging cropping, when corn was high priced too, was decidedly worth more than two guineas an acre. But there may have been, as already intimated, features in the transaction which would alter its character, and perfectly justify the landlord in his mode of acting.

The same gentleman had been liberal and judicious in his treatment of his tenantry and property in other instances; for example, he had let mountain lots, not far distant from French

Park, rent free for seven years, and given timber to those who undertook the reclaiming of them.

From French Park to the verge of Mayo, bogs abound. The eye at length rests upon Lough Glyn, the seat of Lord Dillon, situated on the lake, and surrounded by fine old timber. The Scotsman is here reminded of the two original larch trees at Dunkeld, as he views two enormous ash trees—supposed to be 300 years old—one of which measures in girth, six feet from the ground, nearly thirteen feet in circumference. The land in the demesne and adjoining it is fertile. The hill —it can hardly be called a mountain, though the highest ground in the county—of Fairymount, is in the background of the scenery of Lough Glyn on the north-east side.

The barony of *Roscommon* has nearly 100,000 statute acres within its limits, including upwards of forty small loughs, many of which, especially towards the eastern boundary, have communication with each other by streamlets, but some of the loughs formed by tributary rills have apparently no outlet; the vent must be subterraneous. Some of these are what are called provincially *turloughs*, shallow sheets of water, disappearing, but not invariably, in summer, and succeeded by coarse vegetation. One of these, the turlough of Mantua, occupies an area of 600 statute acres. Altogether, the proportion of land under water in this county is very considerable.

Lord Hartland possesses a fine demesne of 1200 acres called Strokestown, and estates worth L. 20,000 a-year in this barony. The village of Strokestown consists of two intersecting streets; one of these is of an extraordinary degree of breadth; if little enclosed gardens were in front of the houses, instead of the present waste and slovenly space, the effect would be very pleasing. The extravagance of the breadth of street is not counterbalanced by any advantages in the way of neatness or embellishment. Though freestone is near the town, the inhabitants use limestone for building, because it is a little nearer, preferring rigid economy to any considerations of mere appearance. For the construction of the few slated houses in the village, slates, as well as timber, are drawn from the town of Sligo, which is thirty-three miles distant. Wherever the soil is suited to it, wheat is cultivated, and two or three crops of oats invariably succeed if the ground be *strong* enough to produce them. The munificence of Nature is here, as elsewhere, constantly abused.

Elphin is a principal town in this division; and such a town! It cannot be more truly or graphically described than in the exact words of Mr Weld:—"Rows of cabins, as disgusting as any that are to be seen from one end of the country to the other, assail the eye; walls decayed; roofs bent and sunken, thatch tattered; no windows; no chimneys; the turf smoke rolling slowly from the doors, or seeking its way through the chinks and crevices innumerable, with which these hovels abound. The appearance of the inmates corresponds with that of the miserable tenements; ill-clad, squalid, haggard, listless, and idle; in every countenance discontent strongly marked, and in some an expression akin to despair. I was assured at Elphin, and I saw no reason to doubt the authority, that several people perish in the course of each winter through want of clothing, nourishment, and fire. In fact, at the time I passed, at the height of the hay-harvest, able-bodied men were soliciting employment, and offering to work for their mere food, which, as every one knows, is of the least costly kind. What, then, must the condition of the people be, when overtaken by the rigours of winter, and unprovided with sustenance!

"Girls, amongst whom were some really pretty and delicate, and of an age and frame of body seemingly but ill-suited to the task, sought a precarious and hard-earned livelihood in hawking turf about the town, in cleaves which they had carried on their backs from the bog, distant about two English miles. The ordinary weight of one of these cleaves was three stone, or forty-two pounds; sometimes it amounted to more. The price *asked* for two cleaves was only 3½d.; but as demands of this kind ordinarily exceed the selling price, 1½d. might be set down probably as the utmost price of a single cleave; from this was to be deducted the cost of the turf at the bog, the small surplus being all the gains for bearing this heavy burden, mostly up hill, and afterwards hawking it from house to house."

Notwithstanding the philanthropy and generosity of the present Bishop of Elphin, who affords a vast deal of employment, it is to be feared that the condition of this town will not be speedily changed for the better. The nature of the tenure under which most of the property is let—leases under the See—is in itself a bar to improvement. These leases are always in the hands of *middlemen*, who, having no perpetuity of interest, and being apprehensive of being charged on renewals, fines in some degree proportioned to the state of the property, leave matters as they are, and sublet at rack-rents.

The barony of *Ballintobber* contains an area of nearly 170,000 acres, and is divided into three portions detached from each other with apparent capriciousness, the eastern portion being separated from the other two, which nearly touch each other at one point, by the intervening barony of Roscommon.

The baronial distinctions throughout Connaught were made without any regard to geometrical arrangement, or to any kind of uniform order. This great barony was formed of the different territories of the great chieftain O'Conor *dhune* (brown or dun coloured, from the colour of his hair, to distinguish him from another powerful chieftain), the ancestor of the O'Conor Don, now in the Imperial Parliament. The irregularity of size, form, and connexion, with which these baronies is marked, so remarkably contrasted with the uniformity regarded in the allotment of townships in Canada, is thus accounted for, in a Parliamentary Report made in 1824:—"The first subdivision of counties is into baronies. These appear to have been formed successively in consequence of the submission of the Irish chiefs or captains who ruled over them, the territory of each forming a barony. This may, in some measure, account for the extreme inequality in size between those divisions of subordinate jurisdiction, and the manner in which parts of them are intermixed among each other." As the chieftains submitted to the English government, and ceded their Brehon rights, they were reinvested with their territories under the denomination which they still bear.

The town of Roscommon, the capital of the county, strange to say, is not within the barony of the same name, but is included in Ballintobber. This is an abominable town, with more than the usual proportion of miserably thatched houses, and all their concomitant filth. Unfortunately, the property belongs to an absentee, the Earl of Essex, who, though he derives a princely revenue from this estate, seems little interested in ameliorating its condition. It is but fair, however, to state, that there are long leases against his Lordship, at low rents. Oh, these middlemen! Here, as in many other towns of the county, are the remains of an extensive monastic establishment, and sadly contrasting its noble ruins with the mean and miserable hovels of modern times which surround it. There is a castle also in melancholy decay.

As to the particulars of soil, grazing, want of hedges, and prevalence of stone-walls, there is so much of sameness on these points through all the parts of the county, that we shall, in the concluding portion of our observations, avoid the repetition of these details, and merely notice the exceptions when they occur.

Lord Crofton, one of whose ancestors had the good fortune to be auditor-general in the reign of Elizabeth, has a very beautiful seat in this barony, remarkably well wooded. This is the more striking, from the paucity of gentlemen's residences in many parts of this portion of the barony, which is wofully bleak, and, though fertile, unimproved, and uninteresting. There are, however, as at Tulsk, woods and plantations, and all the evidences of a proprietary, with local habitations and a name. Castlerea is one of the principal towns in the county, and has the advantage of having as its proprietor a resident nobleman (his house and lands adjoin the town) of extraordinary moral worth. Lord Mount Sandford is truly an honour to *his order*. Every thing here indicates the presence of an amiable and wealthy landlord, solicitous to promote the welfare of his tenantry, and conscious of his own responsibility to the Giver of his wealth and power. His lordship is especially the friend of the cottager, whom he labours to elevate in condition by every means within his power; and, with the active superintendence of a good agent, much positive improvement has been effected on this property. It is painful to draw mortifying comparisons; but it is often necessary to do so, for the sake of public benefit, and to stimulate to a sense of propriety, by the influence of *shame*, those who are insensible to the finer and nobler impulses of the human heart. Mr Weld says,—

"Whilst such admirable examples of improvement were offered on Lord Mount Sandford's estate, grateful to the eye of every traveller, grateful to the feelings of every person interested in the prosperity of the land, it was a subject of regret to find them utterly disregarded on other properties in the same neighbourhood; not a property of much extent, indeed, but still large enough to exhibit a melancholy contrast. Here small divisions had been made, some as low as half an acre; a quantity, considering the nature of the ground, insufficient for the support of a family, whilst employment to assist towards maintenance was avowedly precarious at every time of the year. The hovels which the poor people were building, as I passed, solely by their own efforts, were of the most abject description; the walls were formed, in several instances, by the backs of fences; the floors sunk in the ditches; the height scarcely enough for a man to stand upright; poles not thicker than a broomstick for couples; a few pieces of grass sods the only covering; and these extended only partially over the thing called a roof; the older people miserably clothed; the children all but naked. What must the condition of such poor people be as their numbers increase! And that they will increase under circumstances not more propitious, experience has proved. The *promise* of a somewhat higher rent than could be obtained from a more respectable tenantry, was said to have been the inducement for this minute subdivision; but where the means of earning money were so limited, such promises must have been vaguely given, and were little to be relied on.

"Strange as it may appear, yet amongst the persons who thus lay the foundations of future distress and misery in the county, by the division of their lands in small portions to a needy tenantry, for the sake of a temporary present gain, were to be found some who, in conversation, seemed to be possessed of enlarged and liberal views, and who could discourse most fluently on the abject condition of Ireland, and the means of her political regeneration. There can be little doubt, I apprehend, that it is, in general, on the lesser estates and properties that the most frequent and ready examples might be drawn of severe measures towards the tenantry, and exactions of the highest rents."

The concluding paragraph is critically true, the smaller proprietors being great extortioners in their demands of rent, the least anxious for the happiness of their dependents, and the most intensely selfish of the class of landlords. The brawlers, we may add, who spout most in favour of liberty and justice at their association meetings, or over their bottles, are, in ninety-nine cases out of a hundred, the most heartless, tyrannical, and unjust of Irishmen, in actual practice. They trade like pedlars upon their politics as they do upon their patches of landed property (if they happen to have any), and expect cent. per cent. for what they give in either capacity.

Mr Wills has the character of being an improving and kind landlord; and his extensive and continuous range of plantations on upland bog, under a mountain adjacent to the road which leads to Ballinlough, indicate his taste and economy.

The half barony of *Ballymoe* is separated from its other and better half in Galway, by the river Suck, and contains but 23,000 English acres. The soil is principally calcareous. The limestone gravel, which abounds here as throughout the county, would be a treasure in the hands of an intelligent and practical farmer.

There is no large village in this district, nor much in the way of timber or thorn-trees to gratify the eye, except immediately about the houses of the gentry, which are comparatively numerous in this neighbourhood. Thirty shillings per acre is the average rent for good land.

The barony of *Athlone* contains nearly 136,000 acres, and occupies the whole breadth of the county, having the noble expansion of the Shannon, called Lough Ree, on its eastern boundary, and the Suck on the opposite side.

There is great variety of soil in this large tract, which, on the whole, differs little from those already described. There is the same bleak appearance, too, from want of trees, even where they would be most ornamental, as around Lough Funcheon, for instance, and the substitution of dry-stone walls for hedge-rows.—"The common dry-wall mason is a most valuable tradesman in a stony district. In the province of Connaught, masons of this kind are every where to be found; and they build their walls without mortar, with nearly the accuracy and closeness of house-masons. They build by a frame two and a half feet at the bottom, and 18 inches at top.—These are the dimensions suitable to a permanent wall of six feet in height, which is usually coped by two substantial sods of three inches in thickness. The first is laid with its grassy side down, on about an inch of level mould, on the top of the wall; and the second, inverted upon that, with the herbage uppermost. This species of fence, with very little attention paid to it, will be safe at the end of fifty years.

Stones per running perch, - -	L.0	4	0
Mason-work per ditto, - - -	0	1	6
Sod-coping per ditto, - - -	0	0	1
	L.0	5	7

In proportion to the diminution of height, will be that of width,—and also the reduction of cost in the quarrying and drawing,—as also in the wages of the mason. In many situations, not subject to the emulative feats of gallant sportsmen, a wall of five feet, which would be much less costly, might be deemed sufficient, or even of four and a half feet solid, or (still cheaper) pinned and dashed with mortar-coping, of nine inches." *

A wall, six feet high, is sometimes rode over by the Connaught fox-hunters; and instances are known of a seven-feet wall being cleared for wagers. This appears to be a *great bounce*, in more than one sense; but it is fact. The horse is turned round short by his intrepid rider, and rather sideways towards the wall, which he actually surmounts, with a degree of agility incredible to those who have not witnessed the feat. The Roscommon horses are remarkably strong, hardy, and active, and probably superior in these combined qualities to any other breed in Ireland. The mode and expense of burning lime by the farmers in Roscommon is thus detailed by the writer to whom we have just referred.

---

* An Address to the Landlords of Ireland, by Martin Doyle. Wm. Currie jun. & Company. Dublin, 1835.

"When turf and limestone happen to occur conveniently, if they are laid down in sufficient quantity for the occasion, besides a lime-kiln prepared in an expensive manner of sufficient dimensions, a country mason, employing his own attendants, in a district where labour is cheap, will undertake, for fifty shillings, to produce 500 barrels of the best lime. This is effected not by a draw-kiln, which is costly in building, and gradual in operation, but by what is termed an *arch-kiln*, erected in a cheap manner, and summary in its process. In many parts of Ireland, where it might be usefully adopted, it is altogether unknown.

"It is a square building in the side of a hill, with one front; at the bottom of which are two apertures, of perhaps three feet high by two feet wide, with an arch turned over each. In packing the kiln, the work commences by the mason turning at the bottom, across the interior, two arches of rough stones, corresponding in size and height exactly with the arches described in the front wall of the kiln. This being done, he proceeds to form arches over these, but without any chamber, and packed as close as the unhammered and unbroken stones will admit; and so on, with a succession of those solid arches, till the entire kiln is thus filled. In this, much labour is saved of the minute breaking of the stones, as for kilns of another description, those which are used in this being of any shape or size that the workmen are able to compass.

"The next operation is to light fires in the under arches, by means of the apertures in front, consisting of furze and turf, and to keep up those fires by the constant throwing in of fuel,—by raking out the ashes through the whole extent of the arches,—and by never intermitting, night or day, to keep up a full and equable heat in the two furnaces.

"This will require a relay of hands, that those who labour by night may rest by day. In the course of three days and nights, the work will be completed. The masons must have two assistants to supply the fires, and men to be relied on for care, when he takes his repose; and, however moderate the sum of fifty shillings may appear, it will pay good wages, for the time occupied, in a cheap country.

"If the lime is to be kept over, it is usual to cover the kiln with a temporary roofing of tough timber and thatch, and to draw out the roche-lime as required, at the arched openings in front. It will sink by its own weight; and, being perfectly burned throughout by pure flame, will yield a quality of lime superior to that which is interspersed with layers of culm or other fuel.

"If the materials be contiguous, their value at kiln, in a sufficient supply for the quantity mentioned, may be about -	L.2 10 0
"Mason's charge by task, - - - - -	2 10 0
	L.5 0 0

A fraction less than twopence halfpenny per barrel of twenty-one gallons. To those who are versed in this mode of lime-burning, this detail may appear tedious, but will not be thought so by persons unacquainted with the practice, and having within their power circumstances favourable to its adoption.

“ The running perches of a six-feet wall, for which this quantity of lime would be sufficient, would approach 120 in number.

Value of lime per running perch, - - -	L.0	0	7½
Ditto of sand, - - - - -	0	0	4½
Ditto of stones drawn within the distance of ¼ mile,	0	4	0
Cost of mason, finding labour, - - -	0	2	6
	L.0	7	6

“ A very substantial enclosure may also be effected at much less cost, by using mortar only in equidistant piers, 2 perches asunder, and connected by a 12-inch course of water-work, 3 feet from the ground, and a coping of mortar at the top. This might be executed by the running perch for six shillings.”

There is less of enclosure in this barony than in others of the same size. Among its little dirty villages is Knockcroghery, rendered classical and immortal by the pen of Miss Edgeworth, where there is a manufactory of tobacco pipes, suitable clay being found there in irregular strata.

The town of Athlone, which is almost the central point of Ireland, has been long a garrison station. From its commanding position on the Shannon, at the only spot, in a distance of thirty miles, where it is fordable, and on the great road from Dublin to Galway, and from being the point where Leinster and Connaught unite, it is admirably suited for a military post. The less that we say of the town the better.

Half barony of *Moycarne*.—This little tract, of 30,000 statute acres, like the half barony of Ballymoe, is severed from its corresponding part in Galway. Two great roads cross this division, which is less undulating than the other districts of the county, and has a very fair proportion of resident gentry, who have a great deal of their lands under plantations; the comparatively good farming here displayed by some of them, is not more than in other places imitated by the humble farmers, whom ignorance, prejudice, or want of means, prevent from moving out of their own defective routine of mismanagement.

There is nothing worth any observation here, for there is nothing peculiar in this tract, nor even a village worth a name. On the western verge is Ballinasloe, by far the neatest and best regulated town in the entire province. The active energies of the late Earl of Clancarthy and his family have effected a change in the physical and moral condition of this little town, unprecedented in Ireland; 265 houses were built between the years 1821 and 1831, all, or nearly all slated, and the suburban parts, so different from their circumstances in all the considerable towns and villages of the west of Ireland, here testify at once that the superintending eye of a resident proprietor has been perpetually fixed on them. The extension of the Grand Canal from Shannon harbour to this town, greatly tends to the commercial prosperity of the town, which communicates by this channel with Dublin, and the intermediate marts of importance.

Every farmer has heard of the fairs at Ballinasloe, where an annual sale of sheep, amounting in number to 60,000 or 70,000, and of 7000 or 8000 horned cattle, is effected. The favourite stock is a cross between the Leicester and the long-horned breed of the country. If the mode of culture in Roscommon were at all proportioned to the number and quality of the stock which it produces, Ireland would have some cause to boast of this portion of her soil; but the tillage of the common farmers is too often execrably bad, and usually performed not with plough, harrow, and roller, but with a spade, thus described by Mr Weld:—" The loy is an implement in very general use in the bordering counties, as well as in Connaught. Rude in construction, and probably the invention of an early age, it has been handed down with little alteration from father to son, and the people reluctantly give it up for the spade, which is of so much more utility in the general purposes of cultivation. It appears quite absurd to one who has been accustomed to the broad English spade, to see attempts made to perform such work as the removal of earth, or loading of carts, with the loy. But for turning up a light soil, where rocks abound, and the plough cannot be used, the long loy, in the hands of an able workman, is an implement at once powerful and efficacious, which might be introduced with advantage in other places where it is at present unknown.

" The block of wood which forms the connexion between the handle and the blade, and at the same time serves for the tread of the foot, is placed on the right side; and Irish labourers generally, even whilst using the English spade, are accustomed to dig with the right foot alone, and to employ the right hand as the fulcrum, contrary, I apprehend, to general English practice. Another peculiarity of Irish digging implements, such as the spade, shovel, loy, &c. is, that for ordinary use, they are invariably provided with longer handles than are customary in England, whereby the labourer is enabled to maintain a more erect position than can possibly be preserved in using the short-handled English spade; and hence, in no part of Ireland is it usual to meet with such bent down bodies and curved backs as are commonly seen amongst old men in England, who have been long occupied at spade labour.

"The *stiveen* or steevan, is another implement employed in Roscommon. Its chief and almost only use is in setting potatoes. It consists of a short pole, sharpened at the lower end, which answers the same purpose as a garden setting-stick; but to increase the power, a cross piece is inserted at a convenient distance from the point, to receive the tread of the foot. After having been forced into the ground with the foot, it is usually turned round, so as to widen the hole prepared to receive the set, or cutting of the potato; a boy or girl is commonly employed to drop the cutting into the hole, which done, the hole is earthed up by a few pushes of the stiveen. Potatoes can be planted very evenly by this method, and the cross piece for the foot also regulates, with considerable exactness, the depth."

The *stiveen* is in fact a dibber on a large scale, and calculated to bear the pressure of the foot instead of the hand. It is common in Munster, and parts of Connaught, when the potato lazy bed is formed (we are supposing the drill system to remain unpractised) for the workman to insert his spade a few inches into the surface (usually an inverted sod), and on the quick withdrawal of the spade or *loy* (called a *fack* in the former province), to drop from the apron in which he carries the seed, a single potato set. After the ridge has been planted in this way, he closes the fissures with the back of the same implement which made them, or with that of a shovel. The furrows are then dug, and the earth shovelled from them on the surface of the beds. These *loys* are effective in sinking through hard stony soil, for which they were doubtless first designed, and where the breadth of surface presented by an English spade, or improved Irish one, would be a serious impediment to its operation; but that which originated in a partial cause has become general in application, even in clayey loamy soils. This spade, with the shovel afterwards, are the only implements used by the *natives* in their potato culture.

The agricultural implements in general use among the ordinary farmers are defective in the extreme. The ploughs are bad, and the ploughmen ignorant; few of the labourers know how to make a good stack. By many of the leading gentry, however, good farming, all things considered, is often exhibited.

When Mr Wakefield visited this county (1809), he had heard that the practice of yoking horses to the plough and harrow by the tail was even *then* known in a few instances. There are at this day examples of this most barbarous usage in the county of Donegal, if not in Roscommon. A friend of ours witnessed last year, in the former county, this cruel and *wasteful* mode of applying horse power. On a future occasion, we hope to give the particulars of locality, &c.

In no part of Ireland could the experiment of employing the able-bodied poor in reclaiming bog land, and other wastes, be more favourably tried than in Roscommon, where there are 80,000 acres of bog alone. The abundance of calcareous manure, and the cheapness of labour there, ought to tempt the proprietors of the soil to industrious enterprise. What a field for the application of wealth and energy! We are tempted to conclude with a passage from Dr Stoke's essay, though we do not agree with the writer in all his principles, and though some of his quaint remarks do not now apply to Ireland, which has been relieved from the restrictions complained of.

> "The administrations of the empire, and of Ireland, seem disposed to relieve us, but public money must be cautiously touched now; they dread jobs, which is not to be wondered at, and they do not know, and cannot easily be persuaded, that much good can be done without expenditure of public money, by the mere expression of their wish, by making the improvement of the country the price of their favour. Let it be the fashion to subdivide land, and to encourage and assist the manufacture of woollens and linens by the fireside of the cottager, for the comfort of the family; you need but say, let it be the fashion. Let all the impediments to the coast trade and fisheries be removed, which can be removed with safety to the revenue: let all the inland navigation be diligently extended, copying rather the cheap and diminutive scale of semi-barbarous nations, than the expensive structures of wealthy societies: let the companies formed for those purposes be compelled to publish their accounts, in order to revive public confidence: let roads be constructed on true principles, and the money levied for them fairly expended: let these things be done: endeavour to procure us internal peace by justice and patience. If these things are done, we can supply the empire with hardy men, and good provisions, on easy terms, and we may contribute to the necessities of the empire in proportion to our capital; not, indeed, to our numbers, or our surface. In estimating our contributions, we should have credit for all the absentee rents spent in

England. Philosophers and manufacturers of England, you are the men I fear. Do not fret about our numbers; let us all be friends with ourselves first, and then with you. Can your friends be too many? What does it concern you whether we eat our potatoes or give them to the pigs! Why should we not eat potatoes if we like them! Do not let us dispute about tastes—the French eat frogs—the Germans are proud of their sour crout—the Greenlanders delight in seal's blood—the Ottomagues on the Orinico eat clay. What need John Bull care what trash the rest of the world devour, whilst he has roast beef and pudding? Some of us eat roast meat with our potatoes, some bacon, some salt herrings, buttermilk, plain salt. You say we live too low—do not tax the salt: let us alone, the more potatoes, and pigs, and children, we have, the more men and provisions you can have, when you want them, and the cheaper.

" I have one favour to beg of you—We have got a little wool, do not object to our twisting up a little to cover our nakedness, and wrap up the children in the frosty nights,

When winds frae aff Sleive Donald blaw,
And pile the door with driven snaw.

No people are so easily fed—that is what vexes you. Let us have a little clothing of our own, and having food and raiment, we should be content. But fear not, we will not be content. The moment we feel whole clothes upon our backs, we will quit burning our shins over the fire; some effort for profit will be made, and then we must be genteel, whatever you say will make us look like gentlemen and ladies, that we buy name you the price; merely allow us to procure for ourselves absolute necessaries; do not muzzle the ox that treadeth out the corn; the harvest is your own; trust confidently to our inexhaustible folly."

D.

THOUGHTS ON DRAINING, AS A SUBJECT OF COMPACT BETWIXT LANDLORD AND TENANT.

Sufficient has been stated in this Journal, to shew that thorough-draining is, under any circumstances, an expensive operation. The completion of a drain in every furrow, fifteen feet asunder, cannot be properly accomplished at the present time, in the most favourable circumstances in regard to the command of materials for filling them, under L.4 per imperial acre, and in less favourable circumstances it may amount to L.8. A large portion of this expense is incurred in the purchase of tiles and soles. It is to be hoped, however, that facilities in the manufacturing of tiles and soles, and in the opening of the ground for stones, and other loose materials, will be discovered by daily experience, that will considerably diminish the expense of thorough-draining; but under any circumstances, as we before said, the most propitious that can be conceived, we fear it must entail on the drainer a large outlay of capital; not but that that capital may be soon repaid by the soil, but the expenditure of large sums on large extents of ground, is inconvenient to most persons. If the tenant disburses the whole outlay, whose interest in the farm he occupies is but temporary, a large outlay can scarcely fail to embarrass him in his other operations; and if the landlord sustain the whole expense, he looks for at least a proportionate rise in the rent paid by the tenant, who alone enjoys the advantages of draining during the currency of the lease. To either, so large a disbursement is likely to prove inconvenient. Now, it may reasonably be questioned, whether the tenant should be subjected to such large outlays of capital, on improvements which possess so permanent a character as thorough-draining. No doubt, the certainty of a profitable return, and even the hope of realizing such a return, induces many a farmer to embark in expensive undertakings, and if they possess sufficient capital, the attempt is unobjectionable, but still the question occurs, Is it fair to place the tenant in such a position as to induce him to risk his capital on permanent improvements on land, from which the landlord is certain of deriving an ultimate increase to his income, though he may not have contributed towards producing the result? Would it not be a more equitable arrangement that the landlord incur a part at least of the risk, so that both may contribute to produce results from which both are certain of deriving benefit? This could be effected by the landlord undertaking to execute some part of the operations, or share in some part of the expense. An arrangement of this sort could be easily formed. For example, if tiles are to be used in draining, the landlord, might erect a tile-work on the most approved, economical, and expeditious plan, and dispose of the tiles and soles to his tenants at prime cost; or he might supply the stones, and cut all the drains; or he might go still farther, and supply all the tiles and soles, or stones, and cut and fill in all the drains. The tenant would undertake the cartage, and payment of 5 per cent. interest yearly, on the outlay incurred by the landlord. This last arrangement we conceive to be the best; for the credit of the landlord being supposed to be greater than that of the tenant, where large sums are required he could borrow money, if that were necessary, on reasonable terms; and he would possibly incur no loss by the transaction, when payment of the highest legal interest was guaranteed to him by the tenant during the currency of the lease, and the increase of rent at its termination would enable him to liquidate the whole loan. But besides insuring safety to the landlord, the best feature in the arrangement is the enabling the tenant to retain his spare capital in his own hand, for the prosecution of those ameliorating and fertilizing operations, as liming and manuring, which must necessarily be practised after the thorough-draining of the soil. In possession of his own capital, he would be able to prosecute these ameliorations with alacrity and vigour, for he could not but be aware that the sooner he put the land in the highest state of fertility, the sooner should he enjoy all the advantages derivable from thorough-draining it. This conviction would prompt him to urge with unabating perseverance, rather than create a desire for a relaxation in the landlord's part of the engagement, even though the additional rent imposed upon him by the payment of the annual interest on the landlord's outlay, should be increased to the extent of eight shillings an acre, supposing the outlay to reach the maximum of L.8 an acre. He is quite sure that thorough-draining, succeeded by meliorating operations, will increase the produce of land much more than will be sufficient to yield the ordinary legal interest on the expense incurred in effecting them. Thus, an increase of produce secures the tenant's, and an increase of rent the landlord's, interest, at one and the same time, when both mutually prosecute the thorough-draining of land.

Thorough-draining thus being a great prospective encouragement both to landlords and tenants, we earnestly wish that landlords would heartily enter into such engagements on the subject, as we have ventured to propose. The proposal for engagements would best be first tendered on the part of the landlords, as it would indicate their desire for improvement; and when they do countenance improvements, and especially when they participate in their execution, tenants prosecute them with the greater pleasure. Were all landlords to co-operate with their tenants in this manner, their properties would not only be soon put into the highest state of cultivation, but a uniformly progressive system of maintaining the land in fertility, would be invariably pursued by the tenants. Such ameliorating and amicable engagements should form the subject of covenants in every lease, until the whole land of the country be thorough-drained, and fertilized to the highest pitch. But even were landlords indisposed to enter into such engagements, the tenants who possess disposable capital should prosecute thorough-draining at the commencement of their leases, for their own advantage. Many tenants of capital are doing so, and are reaping, while they are proceeding in improvement, benefits from their enterprise; and many who have no spare capital, are nevertheless prosecuting it on a scale proportionate to their means, with the hope of ultimately realizing an adequate remuneration for the risk. The struggling efforts of the latter class of tenants are undoubtedly praiseworthy, and they should attract the sympathetic co-operation of their landlords; but their labours must necessarily impart a limited benefit, and much time must elapse before they can produce a sensible change for the better, on the condition of the tenantry. The amelioration of the whole soil of the country affected by such limited means, would be the work of ages. Unless, therefore, landlords step forward, and at least co-operate with those of their tenants who have small capitals, by entering into engagements to prosecute their mutual object on an extensive scale and a matured plan, all the great and undoubted benefits derivable from thorough-draining will be very long delayed. Some landlords, we are happy to know, have cheerfully entered into such engagements with deserving tenants, and we are convinced they will ultimately derive ample satisfaction and profit from the connection.

Before taking leave of the subject of thorough-draining for the present—a subject which we conceive we have viewed in this series of papers in all its bearings—we would strongly recommend the use of tile-soles in every case where drain-tiles are employed in draining. The expense of draining will, no doubt, be thereby increased, but the security permanently imparted to drains by their use, will more than compensate for the additional cost. This is a very essential consideration for landlords, whose interest is to secure permanent stability to drains formed in their lands; and this circumstance, were there no other, should operate powerfully upon them to desire to participate in their formation.

It is a general belief that strong clay, such as that of the Carses of Scotland, and of that which forms many of the subsoils of this country, will remain permanently firm under drains. However well adapted carse clay, and other clays having small stones embedded firmly in them, may appear, on being new cut, to withstand the melting action of the small quantity of water which usually runs in drains, there is no doubt they will become in time as soft, by constant contact with water, as to admit the sinking of drain-tiles, from the incumbent pressure of the materials placed above them. A knowledge of such an effect has been derived from no imaginary source; it has been, unfortunately for drainers, derived from experience. It has been discovered in Ayrshire, where tile-draining was first prosecuted with vigour on a large scale, that drain-tiles placed on a clay subsoil, which was considered firm enough at the time of the cutting of the drains to support them without tile-soles, had sunk as far down as the spring of the arch, in the course, we believe, of only three years, when portions of the drains were taken up to decide a wager made by a person, who affirmed that the drain-tiles had sunk, with the drainer, who maintained they retained their position. The disappointment to the drainer, on the discovery of the truth, was, of course, very great; but where one such event has been discovered, the probability is that many more have occurred in similar circumstances. The only effectual remedy against the recurrence of such an event, is the relinquishment of the usual method of constructing tile-drains in clay land, and the universal adoption of tile-soles, whenever drain-tiles are employed, in draining land of every description.

AGRICULTURAL CHEMISTRY. NO. II.

By Henry R. Madden, Esq. L. R. C. S., Edinburgh.

Having, in my last paper, given a brief outline of the chemical composition of soil, I proposed in the next place to consider what was necessary in soil to fit it for maintaining vegetable life. The first point to be considered, therefore, obviously must be, what do plants require for their nourishment, or, in other words, What is the food of plants? In treating this question, there are so many chemical terms which must be employed, and so many chemical changes to be explained, that it will be absolutely necessary, in the first instance, to give a brief account of the various component parts of vegetables.

When vegetable matter is completely disorganized, as, for example, by fire, it is found to consist of those *elementary* substances, to which chemists give the names of *carbon*, *oxygen*, *hydrogen*, and sometimes also a minute quantity of *nitrogen* or *azote*. The manner in which these substances are combined in the plants when living is entirely unknown; but, nevertheless, an acquaintance with their general properties is essential, in order to understand how they are brought within the limits of vital action.

Carbon exists pure in nature in the *diamond*, and, mixed with other substances, it forms *plumbago*, *charcoal*, *coke*, &c. Whenever it is obtained pure artificially, it is in the form of a black powder; of the various forms in which this substance presents itself, charcoal is the one which we should more particularly notice, as this is the form in which *carbon* is obtained from vegetables. It must be well known to all that charcoal is procured by heating wood in *close* vessels. Considered chemically, this substance consists of a large quantity of *carbon*, together with various saline ingredients; this may be easily seen by burning charcoal, the *carbon* alone is dissipated, and the saline matter is left in the form of white ashes. The chemical relations of carbon, which it will be necessary to explain in this place, are chiefly its affinity for *oxygen*.* These two bodies, when united together in the proportion of 6 parts of the first to 16 of the second, form the well known gas *carbonic acid* (choke-damp); they also unite in various other proportions, giving rise to very different products; but these are not of such importance to the agriculturist. Let us now, therefore, consider the properties of carbonic acid. This gas, as I have already stated in my last paper, always exists in a free state in the atmosphere, and in the form of choke-damp; and when combined with various other substances, it constitutes that class of bodies which chemists denominate carbonates, as carbonate of lime (chalk), carbonate of soda (common salt), which consist of lime and soda, respectively combined with carbonic acid. It is always formed when charcoal, or any substance containing carbon, is burned in the air; for since the atmosphere contains oxygen, and these two bodies (carbon and oxygen) cannot be brought into contact at a high temperature without uniting, it is clear that this gas must be formed when charcoal is heated in the air; in point of fact, it is the attraction of these two substances for one another which *produces* combustion. There is still another mode, however, by which these substances may be made to combine, namely, when either of them is presented to the other in a *nascent* state. To explain what is meant by the term nascent state, I may quote a familiar example. In a common soda or effervescent draught, when you dissolve the contents of the two papers separately, and then add the solutions together, effervescence takes place, owing to the escape of carbonic acid gas from the carbonate of soda. Now the gas, at the *moment* that it leaves the soda, is said to be in its *nascent* ("coming into being") state. The union of carbon and oxygen may be conveniently expressed by saying that the oxygen dissolves the carbon.

---

* I have not thought it necessary to give a minute explanation of the dif-

Oxygen is the next elementary principle which we have to consider; when free, it is always in the form of gas, in which state it exists in the atmosphere, constituting one-fifth of that important aeriform mass, the remainder being *nitrogen;* it

---

ferent chemical terms which I have to mention, as I can scarcely conceive it possible that any of my agricultural readers can be totally ignorant of a science, a general knowledge of which may be gained from almost every periodical in the three kingdoms.

also exists in immense quantities in combination with other bodies, for example, eight-ninths of all the water of the globe is oxygen; in fact, it has been calculated that *one-half* by weight of the whole globe is oxygen. This gas is absolutely necessary to life, both animals and vegetables speedily losing life if deprived of it. With regard to its chemical relations to carbon, we have already spoken at considerable length, a few words will therefore suffice. We have before remarked, that, to form carbonic acid, only 6 parts of carbon are dissolved by 16 parts of oxygen, but in plants these two elements are never in that proportion, the carbon being always in excess; hence, when wood is burned to ashes in the open air, in which case *all* the carbon is dissolved, a large quantity of the oxygen necessary for that purpose is supplied by the *atmosphere;* and hence also, when wood is burned in *close* vessels, carbon in the form of charcoal is left, as in this case the only oxygen which can be obtained is that existing in the wood itself.

Hydrogen.—This gas most probably does not exist in the free state in any considerable quantity, but it is contained in large quantities in various compounds, as, for example, in water, all vegetable and animal matters, &c. The chemical relation of this gas which we shall consider is chiefly with oxygen. These two elements combine in the ratio of one to eight, and form the familiar fluid *water;* they may be made to combine in the same ways as carbon and oxygen, namely, by heating various organic substances which contain them, or by bringing either of them in contact with the other in a *nascent* state. Hydrogen unites also with carbon, forming various gases, oils, &c., but these are not so immediately connected with the subject of my present paper, as to require any particular consideration. Let us, therefore, direct our attention to the last of the four elements which compose vegetable matter, *Nitrogen*, or *azote*, as it is often named. This also is a gas when not in a state of combination. It exists in nature abundantly, forming, for example, four-fifths of the atmosphere; it is also contained in large quantities in *animal* matter. Vegetables, however, contain it in very small proportions; in fact, a great many have none at all; we shall not, therefore, require to say any thing more concerning it at present. The *earthy* and *saline* matters found in plants are, for the most part, the same as these found in earth, viz. silica, alumina, carbonate of lime, magnesia, &c., and several salts, which likewise frequently exist in the earth in small quantities, as *carbonate of potassa* (potashes), *muriate of soda* (common sea-salt), &c. These saline matters will come to be considered more at length when we are treating of the plants themselves.

Having completed this brief sketch of the components of vegetable bodies, let us now see what natural compounds exist, which may be made the means of supplying plants with these various ingredients. We have seen that the generality of plants contain (in addition to saline matter) three elements only, namely, carbon, oxygen, and hydrogen, and that a few contain a small proportion of nitrogen; we have seen, on the other hand, that *carbon* and *oxygen* exist abundantly in nature in the form of *carbonic acid;* that *hydrogen* and *oxygen* are even more abundant in the form of *water;* and that *nitrogen* and *oxygen* are most abundant of all in the form of *atmospheric air.* Hence we might be led to conclude at first sight, that *carbonic acid*, *water*, and *air*, could supply all that was wanted by vegetables, and since air always contains both the others (water and carbonic acid), one might suppose that it alone would be sufficient for maintaining vegetable existence. How widely this differs from truth it is needless to say. We all know that most of the higher orders of plants cannot be made to vegetate without *soil*, *manure*, *water*, *air*, *heat*, *light*, and, most probably, *electricity;* hence it is clear that we must examine more carefully into the *physiology* of vegetable life before we can arrive at any conclusion, as to what is essential, and what superabundant.

It is certainly true that some seeds will germinate and even produce apparently healthy plants, without either *soil* or *manure*, if supplied with *air*, *water*, &c.; but, nevertheless, these plants are not to be considered by any means perfect; for, in the first place, they do not contain any saline ingredients, except the small quantity which pre-existed in the seed; on which account, plants grown in this manner do not possess that degree of firmness of texture which would have been the case had they been grown under circumstances more congenial to their habits; and, moreover, we may always rest assured of the fact, that unless plants are supplied with *every thing* which they contain when in a state of nature, they need never be expected to thrive, or produce any valuable return for the trouble and expense attendant upon their cultivation. From these remarks I think it will be apparent to all, that it is useless to attempt an investigation of the food of plants, until we are perfectly acquainted with their *physiology*. To this important point, accordingly, we must now turn our attention.

In an undertaking like the present, of course it will be impossible to give more than a superficial sketch of the functions of vegetables; but, in doing so, we must endeavour, as far as possible, to omit what is purely theoretical, and enlarge only upon such points, the knowledge of which is absolutely necessary in a practical sense.

Plants may be said to consist of two great parts, the root and the stem, with their various appendages. But since we are in this place merely to consider one function of vegetable life, namely, the function of *absorption*, or the manner in which plants bring matter, external to themselves, within the range of their vital actions, we may confine our researches almost entirely to the *roots* and *leaves*,—these being, beyond doubt, the parts by which extraneous matter is first received into the plant; and, in the first place, let us examine the functions of the root.

The term *root* is generally considered to include all that part of the plant which is beneath the surface of the soil. This, however, is not strictly correct; for many plants possess what botanists call a *rhizoma*, or underground stem. The true root is that part of the plant which, from the instant of its bursting the coverings of the seed, begins to direct its course downwards (or towards the earth's axis), "with a tendency so powerful, that no known force is sufficient to overcome it." Moreover, it differs from the stem in many of its characters; thus, it does not divide itself into smaller fibres in the regular manner, in which stems generally give off their branches. Again, it never produces leaves or scales; and another important distinction is, "that it never becomes green (at least in its tissue) when exposed to the action of air and light, while all the other parts of vegetables, when thus exposed, assume that colour." The root is divided into the body and fibres, the latter of which will alone claim our attention. These fibres are furnished at their extremities with a remarkable structure, which, from its resemblance to a sponge, has been termed *spongiole*. It consists of an extremely loose texture, and is most probably merely "the newly formed" internal "tissue" of the root itself, deprived of its more dense covering, or *cuticle*, as it is termed. This opinion is very much strengthened by the well-established fact, that roots grow by their extremities only. In this manner the spongiole is always being renewed; and, what is of still more consequence, is never *long in one place*. On this account it is that plants which live many years (if not growing too near others of the same kind) are not liable to die from having exhausted the soil; or, in other words, are not liable to be starved to death; for it is evident that, by the constant *change of position* of the spongiole, which is the only part of the root by which nourishment is received into the plant, there must be a constant supply of food, so long as the soil around it contains any organic matter in a fit state for absorption. It has been shewn, by innumerable experiments, that the spongioles, or absorbent extremities of the roots, cannot take up any thing but fluids; or, at all events, if they can absorb solids, they must be in such a minute state of division, that they would remain suspended in water, even for a considerable time, which is a fineness of particles far greater than will probably ever be attained by any *mechanical* means.

It has likewise been proved, that plants are capable of choosing, to a *certain* degree, their food; or, in other words, of selecting those substances which are best adapted for their peculiar nature, and rejecting what would be injurious. This power, however, appears to be limited, as it is perfectly possible to destroy a plant by giving it poison by the roots. The root, moreover, has the power of *excretion*, or returning to the earth such matters as are either useless or injurious. From this last property of roots, we may draw two valuable conclusions; *first*, That in order to poison a plant, the substance used must be capable of acting rapidly, or it will most probably be rejected before it has had time to produce its effect; and, *secondly*, that since plants reject substances *useless* and *injurious* to them, the soil where they grow may in time become so impregnated with such substances as to render it incapable of supporting the *same species* of plant any longer; or at least until such time as the rejected matter shall have been decomposed. This point will be enlarged upon when we come to treat of the rotation of crops. The next purpose which the roots of all land, and the majority of aquatic plants, serve, is obviously to fix it firmly in its place. On this account, we find, in *many* cases, that a certain proportion exists between the size of the stem and the root. This, however, is subject to exceptions. But, on the other hand, in all cases an obvious relation may be perceived between the *form* of the root and the kind of soil in which the plant grows. Thus, if two specimens of the same plant—some of the grasses, for example—be found growing, the one in clayey, the other in a sandy soil, it will be seen, on examination, that the root of the one growing in the sand is much more minutely subdivided, and contains many more small fibres, than the one which grew in clay; and the reason of this is obvious: We have already seen that the spongioles are the only absorbent parts of the root; that they exist only at the extremities of the smallest fibres; and, moreover, that they can take up nothing but what is presented to them in the form of solution. Now, in the clayey soil, from its retentive nature, the soluble parts are not allowed to drain away; and hence the plant is supplied with food near at hand, and, consequently, a few short fibres are sufficient. On the other hand, plants growing in sand are frequently deprived of all fluid near them, by the sinking of the soluble matters through the loosely aggregated soil; in which case the plant would inevitably perish from starvation, were it not for the wise law of Nature, which provides against such calamities, by endowing the roots of plants, placed under such circumstances, with the power of shooting forth innumerable minute fibres in all directions, in order that advantage may be taken of every drop of moisture which falls in their neighbourhood. Nor is it merely in the number of minute fibres that the roots of plants growing in sand differ from those which inhabit the stiffer soils. The form of the *body* of the root is distinct; thus, nearly all bulbous, and other large succulent roots—as the turnip, for example—require sandy soil; and, moreover, some plants—as that species of grass named *Phleum pratense*, (meadow cat's tail, or Timothy-grass)—change the form of the root, according to the soil they inhabit; thus, in stiff clays, the plant just mentioned has a fibrous root, whereas in sand it becomes bulbous, and assumes all the characters of *Phleum nodosum*. The explanation here is as evident as in the former case. The bulbs of the roots act as reservoirs of food for the plant; thus, in very dry seasons, these bulbs shrivel up, their fluids being all needed by the rest of the plant, and hence withdrawn. So beautifully do we perceive in this, as in all other cases, that design and adaptation of means to specific purposes, which must impress even the most sceptical with the absolute existence of a *Great First Cause*. So much for the root and its functions.

Important and complicated as these may appear, the *leaf* performs offices of a much more obscure nature. In the words of the justly celebrated Lindley, "Leaves are at once organs of respiration, digestion, and nutrition. They elaborate the crude sap impelled into them from the stem, parting with its water, adding to it *carbon*, and exposing the whole to the action of air." To describe fully in this place these numerous operations, would not only occupy far too much space, but would, to a certain degree, be foreign to our subject, as all we wish to examine at present is, how the nutritious matter gets into the plant, putting completely out of sight the question as to what becomes of it after it is absorbed. From the sentence above quoted, we find that *carbon* is added to the sap by the leaves. By this is not meant, however, that it is without that substance until it reaches these organs, but merely that an extra quantity of this element is hereby added to it. How, therefore, is this accomplished? We have already repeatedly stated, that carbon always exists in the atmosphere in the form of *carbonic acid gas*. Now, it has been ascertained that the leaves, while exposed during the *day* to the sun's rays, have the power of absorbing this carbonic acid, and afterwards decomposing it, the *carbon* being retained, and the *oxy-*

gen given out again in the form of gas. During the *night*, however, or in the shade, no such change takes place. Carbonic acid, indeed, may be absorbed, probably in the form of a solution in water, as it is well ascertained that leaves take up moisture during the night; but it does not appear to undergo any decomposition: part of it, in fact, is given out in an undecomposed state; and as oxygen is removed from the air, at the same time that this evolution of gas is going on, it is supposed that plants have the power, during the *night*, of absorbing oxygen, which dissolves part of their *carbon*, and re-escapes in the form of *carbonic acid*. Thus we see that, during the night, the exact reverse is taking place to what was effected while the leaves were exposed to the rays of the sun. In the latter case, carbonic acid being absorbed, the carbon is retained, and the oxygen evolved; whereas in the former oxygen is absorbed, and carbonic acid given out. What is the ultimate effect of these complicated and apparently inconsistent changes, it is hard to say. The fact, however, remains unalterable; and from it we may draw at least two very valuable conclusions: *First*, From what we have said with reference to the formation of *carbonic acid gas* during the burning of vegetable matter, and since it is well known to all that this gas is likewise contained in great abundance in the breath of all animals, it is clear that, unless there were some process in constant operation of removing it from the air, our atmosphere would soon become so contaminated with this noxious gas (choke-damp), that it would be incapable of supporting life. Now, it has been conjectured that this constant absorption of carbonic acid by plants during the day, and the evolution of oxygen (the constituent of air most essential to life), has the effect of preserving the healthy condition of the atmosphere. *Secondly*—But, on the other hand, it is equally important to remember that the reverse takes place during night; plants at that period *vitiating* the air; which accounts for it not being healthy to sleep in apartments where a great number of plants are growing. But to return from this digression. From the facts above stated, we find that the leaves absorb carbonic acid and water; and, for the present, we shall rest content with this, and proceed at once to consider of what the food of plants really consists,—now that we are so far acquainted with that important function exercised by plants—namely, absorption—by means of which they receive their nourishment. And, in the first place, we may very briefly shew the analogy which exists in this particular between plants and animals; by doing which we shall be enabled to render the sequel much more intelligible. It is well known to all who are conversant with the functions of living animals, that after the food is received into the stomach, it undergoes certain changes; one of the most important of which is its being rendered *soluble*, and afterwards is *absorbed* by a special set of vessels called *lacteals*, and is then carried to the lungs to be converted into blood. Now, the analogy is perfect, if we take into consideration that plants have no stomach, and, therefore, all the preparation which takes place in the stomach of animals has to be performed in the *soil*. Hence Greisenthwaite, a most ingenious writer on this subject, says,* "The soil may be regarded as the stomach, the common receptacle of the food of plants, in which manure is converted into substances that are soluble; and afterwards those soluble substances are absorbed by the capillary tendrils of the roots, in a manner exactly similar to that already observed of the *lacteals* in animals." A moment's reflection will at once, therefore, clear up all difficulties; for we perceive that the *spongioles* of the roots act exactly as the *lacteals* of animals,—namely, they absorb the soluble matters prepared in the stomach (soil), and carry it to the leaves to be converted into *perfect sap*, which process likewise corresponds exactly to the conversion of the matter absorbed by the lacteals into perfect blood.

The food of plants may therefore be said to consist of the soluble parts of the *manure*, and likewise of *carbonic acid*. We must next, therefore, consider, *first*, Of what does the soluble part of the manure consist, or, what *must* it contain in order to be sufficiently nutritious to the plants which absorb it? *secondly*, How is this matter rendered soluble? and, *thirdly*, What is the best method of procuring a constant and equable supply of this soluble matter to the plant? These are all

---

[*] New System of Agriculture, by Greisenthwaite. Second Edition, p. 103.

questions of such fundamental importance to insure the successful practice of agriculture, that each of them must be considered separately. The third point, however, must be deferred until we treat of manures.

First, then, of what does the soluble matter of manure consist? On this point there has been the greatest difference of opinion; some confidently asserting that all that is absorbed by the roots of plants, is water holding in solution carbonic acid, and various saline matters; others, again, suppose that in all cases a distinct vegetable compound is formed, to which they have given the various names of *Ulmin*, *Humin*, *Humic acid*, &c. Now, as far as practice is concerned, it really is not of much consequence whether the composition of the soluble matter of manure is, in all cases, precisely the same or not; in fact it would be easy to shew that it could not be so; as, for example, the soluble matter of *animal* manures will contain *nitrogen*, which cannot be the case with that derived from most *vegetable* matters; again, and this is of the greatest importance, the saline impregnations will frequently be different. But the diversity of opinion above mentioned, may, nevertheless, give rise to errors in practice, unless the point be in some measure decided; for, on examining into the question, it will be found that those who hold the food of plants to be merely *carbonic acid water* and *saline matter*, evidently suppose that the vegetable matter must be *completely* disorganized, before it can be available to the wants of vegetables; whereas, the supporters of the last opinion, namely, the formation of *Humic acid*, &c. manifestly consider that *partial* destruction only is necessary, or, in other words, they suppose that, during the decomposition of organic matter, one of the first steps is the rendering of insoluble matters *soluble*, and that as soon as this change is effected, they are capable of being absorbed by the spongioles, and carried into the general circulation. Now, the adoption of the first of these opinions may be dangerous to successful practice in the following manner:—If it be supposed that all that is requisite in manure is, that it should furnish the plant with a constant supply of *carbonic acid*, it would not be considered of any importance whether the manure was obtained from the *animal* or *vegetable* kingdom; in fact, the latter would be preferred, in so far as it is decomposed more slowly, and hence its effects would last longer; but were such a practice to be persevered in, the farmer would soon find reason to regret that he had changed his *routine* practice, in order to adopt the suggestions of scientific men; for it would inevitably happen that two at least, if not many more, of his most valuable crops would fail completely under such a system of husbandry, I mean his *wheat* and his *turnips*. Let us now see why these would fail more than others, or, to express it differently, let us ascertain what these plants require, which is not capable of being supplied by the decomposition of "*common vegetable matter*," by which term is meant such vegetable substances as contain only *carbon*, *oxygen*, and *hydrogen*. On analysing the *grain* of wheat, and the *bulb* of the turnip (the parts for which the crops are cultivated), it is at once found that both of them contain *elementary* principles not entering into the composition of "*common vegetable matter*," namely, *nitrogen* in the grain of the wheat, and *sulphur* in the turnip, besides which the *saline* matter is also found to be peculiar, but this last will be considered more fully hereafter. Having once, therefore, discovered that these elements are essentially necessary for the growth of the above-mentioned plants, we are evidently led to ask ourselves the question, Whence are they to be obtained? Dear bought experience has long since answered, *in animal manures*. Yes, all substances derived from the animal kingdom contain more or less of both nitrogen and sulphur, and hence the value, or, in fact, the absolute *necessity*, of such manures for the particular crops now under consideration. It may, indeed, be said by some, that "however necessary animal manures may be for turnips, still there can be no absolute necessity for their application to the wheat crop, for, as nitrogen is the substance here wanted, surely the atmosphere will present a ready and never-failing reservoir of that element." But it must here be remarked, in answer to such a statement, that it is exceedingly probable that the *higher* orders of plants, at least, *never* obtain the nitrogen they possess from the atmosphere, but always from decomposing *animal* matter. The consideration of this interesting subject, however, we must defer until we treat of the theory of "*specific manures*."

Before speaking of the next opinion, I must briefly call the attention of my readers to the important fact, that although *practice* has long ago shewn the necessity of *animal* manures for the above mentioned crops, still *chemical analysis* alone could ever have explained the *reason* for this necessity; thus placing the advantages to be derived from this science in a truly prominent and important light. To return, however, to the more immediate subject of the present paper, we may observe, in the next place, that, were the second opinion, with reference to the food of plants, to be considered as implicitly correct, this likewise might lead to serious losses in the following manner. Those who adopt this theory evidently consider that the *soluble organic matter* formed during the decomposition of manure, is the chief agent by which the nutrition of vegetables is effected, and hence, by them, all the other parts of the manure will be comparatively overlooked, or altogether rejected; now, although, as far as the supply of organic matter is concerned, this practice would not be attended by any serious losses of *crops*, still it would lead to a most unwarrantable waste of *manure*. It has been long ago proved, that, during the formation of these soluble matters in manure, a large quantity of *carbonic acid* is given off; hence it follows, that were these soluble matters prepared before the manure was applied to the soil, the whole of this valuable substance would be lost; whereas, on the other hand, were they formed *in* the soil, the carbonic acid gas, as it was generated, would either be dissolved in the water always existing in soil, and in this state be absorbed by the roots, or it would rise into the air in the form of gas, and thus supply the leaves with the *carbon* which these organs have the power of fixing during the day. It is, therefore, perfectly clear, that in this, as in all other cases, "*virtus stat in medio*," and that, in order to ensure successful practice, we must never allow ourselves to be carried away by *any* theory, but must give to each opinion its due share of importance; and, in this manner, by guarding as well against prejudice as against too great credulousness, we may rest assured, that our improvements will proceed much more rapidly and certainly than they do at present, and may confidently look forward to the time when the philosopher and the farmer will proceed hand in hand, each alike encouraging the other, but at the same time checking their progress should either shew any inclination to outstrip the other; since, beyond doubt, the old maxim of "*slow but sure*" holds as true here as elsewhere. After the remarks already made, it must appear clear to all, that the soluble matter of manure *must* essentially consist of *carbon*, *oxygen*, *hydrogen*, and for some particular plants *nitrogen*, together with various saline matters; but, at the same time, that these elements need not be in the form of *carbonic acid*, *water*, and *air*, but in any state of combination as long as they are *soluble*.

The next question must, therefore, now be considered. How are these matters rendered soluble? This point is one of the greatest importance to the agriculturist, because on it depends the success of all his operations; for since we have proved, that whatever manure is used it must be first rendered soluble, it is perfectly clear, that a correct knowledge of the manner in which this change is effected would greatly increase the chances of their successful application. Unfortunately, however, it is a subject involved in the greatest obscurity, and, I must confess, that it is with fear and trembling that I enter upon its consideration. So much has been already said, and so many theories already advanced, in reference to this truly interesting but mysterious subject, that it would be impossible, in an undertaking like the present, to even mention them all; we must, therefore, confine our observations to those theories only which appear to us the most deserving of consideration, and, in doing so, it will be found that not one has yet been made known, against which many serious objections may not be advanced.

First, then, the most important probably of all the theories, is the very old one, namely, that the various component parts of vegetables are rendered soluble by undergoing those peculiar chemical changes which constitute the process of putrefaction. Now, in an abstract sense, this is certainly true; we have only to watch the process of decay as it occurs in a common dunghil, and we shall at once see, that, during the various changes which take place there, the mass becomes more and more soluble, until at last the woody parts are so far softened and reduced, that the whole will cut like so much moist earth; and if water be poured upon it at this period, it will be found to acquire a dark brown colour; which fluid, when dried up, will yield what has been termed *extractive matter*, &c. (*impure humic acid*). From this, therefore, it is evident that insoluble vegetable matter is rendered soluble during putrefaction. If, however, we examine *rich loam*,—or, in other words, soil in the *best possible* state for growing crops, we shall not be able to detect the soluble matter, in the manner already mentioned. For example, were we to steep the earth in water, or even to boil it with that fluid, it would, in most cases, impart little or no colour to it; and the water, when dried up, would hardly yield any thing but a minute quantity of saline matter. Here, therefore, a great difficulty arises: How is it that the water, naturally existing in soil, is able to dissolve this organic matter, and render it fit for the use of vegetables—whereas, if water is poured upon the earth, or even if the earth is steeped for a length of time in that fluid, scarcely any appreciable quantity of vegetable matter is dissolved? This is the objection which has given rise to all the other theories which we shall have to mention. Until the above important fact was known—namely, that water does not dissolve any material quantity of vegetable matter from even the best soils—agriculturists were perfectly content with the theory already adverted to; but in this the age of research, nothing is allowed to be passed over; all theories are now sifted to the bottom; and, to one unacquainted with the mysteries of science, it will appear truly astonishing that so many theories should have been overthrown within the last few years, which stood for centuries previously without contradiction.

Of all the ideas which have of late been advanced, in the hopes of explaining away the objection above alluded to, two only will, for the present, engage our attention. The first has been advanced by those who imagine that the soluble matter of soil is at all times essentially the same; or, in other words, those who believe in the existence of *humin*, or *humic acid*. These individuals endeavour to explain it on strictly *chemical* principles. They have ascertained, by experiment, that if soil is boiled with a solution of any alkali (as potass or soda), a considerable quantity of vegetable matter is in this manner dissolved, which gives the fluid a dark brown colour, and from which the vegetable matter can be obtained either by adding some acid (oil of vitriol, for example), or by evaporating the whole to dryness, in which latter case the organic matter is found in combination with the alkali. These facts certainly prove that there exists a something in the soil, which is soluble in alkalis, and insoluble in acids, and is, therefore, so far possessed of the essential properties of an acid; hence the term *humic acid.* Those, however, who have gone still further, and who, by various chemical processes, have separated this acid from soil, have likewise shewn that with *lime* (the alkali by far the most frequently existing in soil) this acid forms a compound of very little solubility, although capable of suspension in water; and in this manner they endeavour to overcome the difficulty about water not being able to dissolve any considerable quantity of vegetable matter from soil. They have further shewn that *humic acid* itself is quite *insoluble* in water. However this may be—and it is no doubt true that these changes can be made in the laboratory—still it does not appear what material advantage would be gained by the adoption of this theory; because, if humic acid is itself insoluble in water, and, moreover, forms an insoluble compound with *lime*, it would almost invariably be in a useless state, as there is hardly any soil which does not contain more or less *lime*, and as the great requisite is solubility, which could in this case only be produced by the humic acid combining with some such alkali, as *potass*, *soda*, or *ammonia*, none of which are even abundant in soil.

Another theory which has been advanced appears to be nearer the truth,—namely, that the *spongioles themselves* of plants exert a peculiar influence over the organic matter in contact with them, and cause peculiar chemical changes to take place in it, by means of which its insoluble parts are rendered soluble. Now, that this may be the case, is exceedingly probable; but it would be extremely difficult to *prove* that it were so. That this action of the spongioles, however, is not absolutely necessary to effect the decomposition of vegetable matter, is proved by the fact, that soil will in time become exhausted, even although no vegetable whatever is growing in it; in which case, of course, the decomposition could not have been effected by spongioles. The action, likewise, of some *mineral* manures tend to throw doubts upon this theory.

We must, however, now leave this interesting subject, as it has already occupied too much of our space; and I am certain that, from the observations that have been made upon it, it will be evident to all, that a great many doubts have yet to be cleared up, and numerous difficulties to be explained away, before we can hope to form any satisfactory opinion upon the point, the greatest difficulty evidently being, to devise some method of *observing* the functions of the spongioles, without placing them under *unnatural circumstances.* I must, nevertheless, confess that there is no subject with which I am acquainted that appears to me more deserving of careful *scientific* investigation. It is comfortable, however, to reflect, that we at least know the important fact, that plants *can* absorb organic matter, mingled with the soil in which they grow; so that, *practically,* the question as to *how* they *prepare* their food for absorption, is not of such vital importance. We shall next consider the various methods that are had recourse to in order to prepare soil for cultivation.

ON MEASURING GROWING TIMBER.

By Mr William Blackadder, Land and Timber Surveyor, Glammis, Forfarshire.

It is generally known that timber, in its rough state, is not measured in such a manner as to ascertain its actual cubical contents; but, for an approximation to what it may contain after being squared up, the girth, or circumference, is taken with a cord or tape-line, from which a deduction is made for the bark, usually in the proportion of 1 inch per foot of the girth; and then one-fourth part of the remainder, or quarter girth, thus rectified, is held to be the side of the square; and this, being squared and multiplied by the length, gives the contents according to customary measure.

The measurement of growing timber is ascertained in a similar manner; but, from the difficulty of getting at the measurable length, and more particularly at the average point, to take the girth, it is in practice generally done by estimation; and sometimes by taking the girth at a point within reach, to serve to correct the estimation with the eye; and, certainly, persons of experience frequently perform it with much precision, and hence have a great advantage over others of less tact. Numerous modes have been suggested to overcome this difficulty, and, from time to time, laid before the public. The two I am now to describe I have never seen in print, though, from the simplicity of their principles, I have little doubt but that they may be known to many others besides those who have drawn their information from my practice, which has now been upwards of twenty years.

First Method.—For very large-sized trees, and of great length, as well as uniformity in their bole, and when either standing singly, or not so crowded but that their measurable height may be seen at a distance equal to that from their roots, the height can be quickly and accurately taken with that useful little instrument the pocket sextant, by setting it at the angle of 45°, and stepping backwards until the reflected image of the point at which the height is wanted coincide with a mark made a few feet above the root of the tree, level with the eye of the observer: the latter height being added to the observer's distance from the centre of the root of the tree, is equal to, or gives, the height wanted. The next operation is to find the diameter at middle height, or at such other point where the most correct average appears to be; and generally the readiest mode to do this is, for the observer to keep on the same spot where the height was found; standing at which, let the reflected image of one side of the tree, at the point wanted, be brought to coincide very exactly with its opposite side, as seen by direct vision; and thus the angle which the diameter subtends will be found; and, by taking the vertical angle to the same spot, the data will thus be obtained for finding the diameter, by the rules of trigonometry; and the diameter being obtained, hence the circumference; and, finally, the quarter girth, and the measurable height, being also obtained, thence the size of the tree, by calculation, or the ordinary tables, or slide rule, or decimal multipliers. (For various other modes, see Dr Olinthus Gregory's *Mathematics for Practical Men*, some of which are very neat.)

But, as customary measurement is not founded upon strict mathematical principles, it is unnecessary, in ordinary cases, to resort to the strict rules of trigonometry; and both a ready and sufficiently correct approximation may be made, if the diameter has been taken at, or nearly at, middle height, and the observation made from the point whence the height was ascertained as above described, by adding to the observer's distance from the tree one-tenth part thereof, which will give the distance from his eye to the point where the diameter is taken; and, by multiplying the distance into the natural tangent of the angle which the diameter subtends, the diameter will be found with sufficient correctness.

As the diameter of trees, when the observer is at the above distance, seldom exceeds an angle of 5°, the natural tangents for every minute up to 5° can be marked in a memorandum-book to the extent of three figures; and, in like manner, the natural secants for every 15′ between 15° and 30° might also be marked; and, by using them as multipliers into the base or observer's distance from the tree, the distance to the point where the diameter is taken will be given more correctly than by adding one-tenth, as above noticed.

The following example will make the foregoing description understood:—A few years ago, having been requested to measure one of the large larch trees at Dunkeld, the following observations were taken:—The ground being level on one side of the tree, a small piece of paper was fixed 5 feet above its root; and, stepping back with the sextant set at 45°, the reflected image of the top of the tree coincided with the paper at 95 feet distance; which, with the 5 feet below the paper, made the total height of the tree 100 feet, being 10 feet more than it had always been previously considered to be. The measurable timber height was evidently seen to be beyond a broken stump; but as, above that point, it was of a very coarse description, from the numerous large side branches striking off, that point was assumed, and found, by stepping forward with the sextant set at 45°, to be 61 feet above the mark, and thus 66 feet above the root. An observation was then made for the diameter at middle height, and found to range between 2° 45′ and 2° 58′, there being some inequalities at the place where it was required to be taken; but most of the observations gave it above 2° 50°. The vertical angle was 25°; and, the secant of 25 being 1·10, which, multiplied by 61, gave the distance from the eye to the point where the diameter was taken of 67 feet; taking the medium angle for the diameter 2° 52′, its tangent is ·05007, which, multiplied by the distance 67, gave 3·35469 feet for the diameter; and 3·355 × 3·142 made the circumference 10·5414, or say 10 feet 6¼ inches; and making an allowance of 10¼ inches for the bark, left 9 feet 8 inches for the rectified girth; the quarter of which is 2 feet 5 inches, which, being squared and multiplied by the length or height of 66 feet, made the cubical measurement 386 feet.

Some other observations were taken thus:—The diameter at the top of what was taken for the measurable timber was found to subtend an angle of 1° 20′, and, the vertical angle being 45°, the secant of which is 1·41, which, multiplied by 61, made the distance 86 feet; and this, multiplied by the tangent of 1° 20′, being =·0233, made the diameter at that point 2 feet, which, multiplied by 3·142, made the circumference 6·284, or 6 feet 3 inches, leaving 5 feet 9 inches for the rectified girth, after allowance for bark, and the quarter 1 foot 5 inches. In like manner, the diameter near the ground subtended 4° 30′, the tangent being ·0787 × 62 the distance, gave 4·8794 feet for the diameter, which being multiplied by 3·142, made the circumference 15·331, equal to 15 feet 4 inches; allowance for bark, 1 foot 4 inches, leaving 14 feet for the rectified girth; the quarter of which being 3 feet 6 inches, and the quarter at the top 1 foot 5 inches, the medium was 2 feet 5½ inches, which, being squared and multiplied by the height, made the cubical contents of the tree 396 feet.

An observation was taken for the diameter at the mark level of the eye (being 5 feet above the ground), for the satisfaction of the party who was present, which was found to be 3° 40′, and made the circumference 12 feet 3 inches. It was tried by the tape-line, and found to be 12½ feet. At 18 inches above the ground, the tree measured 16 feet round; but this was occasioned by some inequalities; and the angle of 4° 30′, for the measurement at the base, was taken a little above that point. As there was some measurable timber above the point assumed for the observation, although of a coarse description, this celebrated tree, in round numbers, may have then been said to contain 400 cubical feet by customary measurement. In spring 1831, when this measurement was made, the tree was ninety-five years old, having been planted in 1736, and having, on the average, acquired each year 4¼ cubic feet of timber. There is another larch tree, within a few feet of it, of nearly the same dimensions.

The soil is rich black loam, or garden mould, of good depth, incumbent upon absorbent gravel, altogether the debris of primitive schists; and the earthy particles of the soil are of the same nature. The situation is a level platform; about 30 feet, or so, above the level of the river Tay, and some few hundred yards distant from it. The whole depth of the platform, down to the level of the river, and below it, is gravel.

Some months afterwards, being near Crieff, I went to see the larches at Monzie, said to have been planted about the same period. There are five of them, growing near together in a shrubbery, or old garden, close by the mansion, three of which are noble trees. My time did not permit me to measure them accurately; but, from some observations made with the sextant, they appeared to range from 200 feet to 250 cubical feet, and were 90 feet in height. The largest measured 21 feet in girth at the base; but this arises chiefly from inequalities, being protruding portions of the roots. The tree tapered very quickly in the bole, and did not carry up timber like those at Dunkeld, but was more ornamental, being feathered with branches to the bottom. The soil is also garden mould, upon an absorbent bottom, a little moist, and which is rendered more so by an ornamental pond close beside them, and only a few feet below their level. The earthy particles of the soil are quite similar to those at Dunkeld, being the debris of primitive schists.

In 1832, Mr Blair, the intelligent forester at Kippenross, near Dunblane, requested me to measure a large larch growing by the side of the Allan Water, at the foot of the Kippenross garden, which was done with the sextant by an operation similar to the one above detailed; and the contents were found to be 170 cubical feet; upon which he informed me, after he saw the result, that, in the previous year, he had it measured in the usual manner, by ascending it with a ladder to obtain the height and girth, and had made it 172 feet. The soil is garden mould upon absorbent gravel, about 10 feet above the level of the water, and within a few yards of it. The earthy particles have a small intermixture of the debris of primitive schists, but are chiefly derived from the trap-rocks of the Ochils, and a little of the red sandstone of the district, which together form a compound of very excellent soil. The tree is still in vigorous growth. I measured it in 1817, exactly in the same manner; and in 1832 it was 15 feet higher, and had acquired about 50 cubical feet of timber.

The height of trees, or any other object, is easily taken by the pocket sextant; and the angle of 45° is the most convenient to obtain it without calculation. Other angles are sometimes used for a different proportion of the base, but are not so certain in practice. It requires, however, some experience in the use of the instrument to take the diameter correctly. But the trouble of acquiring this practice will be well repaid by the numerous uses to which this excellent instrument is adapted, for the purposes of practical men and amateurs. Some are fitted with a small level, which enables the height of the eye to be marked correctly above the root of the tree; but this can be done with sufficient correctness by suspending a plumb-line from the sextant, and setting it at 90°; when the reflected image of the plummet upon the tree will mark the point; but, generally, for all useful purposes, the point can be ascertained with sufficient accuracy by the eye.

Second Method.—It will be seen that the first mode is only for amateurs, or for very particular cases in business, such as the examples narrated; but this second mode is entirely practical, and, I may say, was forced upon me by the necessity of the case. Having been employed to mark and value a large quantity of full-grown timber for a particular purpose, I found the mode of taking the girth within the reach of a man very unsatisfactory, the trees being of very great height. About the same time, having seen Mr Monteith's machine, I perceived that it was unsuitable for despatch in business, and felt much disappointed: but the thought immediately occurred, that the quarter girth might be as readily ascertained from the diameter as the circumference, and as correctly as customary measurement requires. Thus, by the application of a diameter gauge, this would be done with the requisite despatch.

The gauge which I then devised, and, with few exceptions, have used for seventeen years, consists of three flat pieces of wood, 2 inches in breadth, and a quarter of an inch in thickness, put together so as to form three sides of a parallelogram; the largest side, or scale arm, being fully longer than the diameter of the timber to be measured; and the other two, or tangent arms, each a little more than one-half of the scale arm. One of the tangent arms is screwed fast upon the end of the scale at zero, their interior edges forming a true rectangle at that point; and the other tangent arm is made to slip upon a scale, and can be drawn backwards and forwards by means of a cord passing over small sheaves fixed for the purpose, and preserving the rectangle. A tubular handle is fixed below the point where the fixed tangent and scale arms join, into which a long pole being inserted, the gauge is applied to the part of the tree at which the quarter girth is wanted, and being light and easily managed, it can be sent up to any height. By drawing the movable tangent arm by means of the cord attached to it, the tree is embraced within the three sides of a parallelogram; and the scale arm being divided in such a manner as to shew the inches and parts of the quarter girth, with allowance for the bark, the quarter girth is thus ascertained at once. The height is taken in the usual manner, with small rods, in 5 feet or 10 feet lengths, fitted to each other by tubes of tin; and while one assistant is applying the gauge, another is applying the rods. The principal directs and checks both, and marks down the quarter girth and height respectively, in regular columns, leaving a blank column for the solid contents to be extended by means of a ready reckoner; and such is the despatch, that a surveyor, with two experienced assistants, could gauge all the growing timber in Kensington Gardens in a few days, nearly as fast as he could examine and estimate the bole, though not the branch timber, tree by tree, with the eye.

The scale for the quarter girth is marked upon the under side, and can be read off without bringing the gauge down, so that various points may be taken, if wanted. Upon the upper side of the scale arm three other scales are marked: one shews the circumference, a second the diameter, and a third the quarter girth, without allowance for the bark; the use of the latter being, that, in particular cases when the bark is either very thick or very thin, a different allowance may be made from the average one. It is also useful in gauging peeled timber when lying upon its side, as it does it much quicker than a cord or tape. The diameter and circumference scales are useful for ascertaining the fitness of a growing tree for any given purpose, at the height or length wanted. None of these scales are calculated with an allowance for the bark.

It will be necessary to observe, that, as the scales are all calculated on the principle that growing timber is truly cylindrical, and as it seldom happens that such is the case, the dimensions thus taken will not be exactly the same as by the usual manner with the cord, but generally somewhat less. On the other hand, as the gauge can always be applied so as to give the dimensions in the manner it may be wanted to be squared up, it can give them more truly for that purpose; but, generally, unless in extreme cases, the difference between the cord and the gauge is not more than between two practical measurers, or the same person at different times.

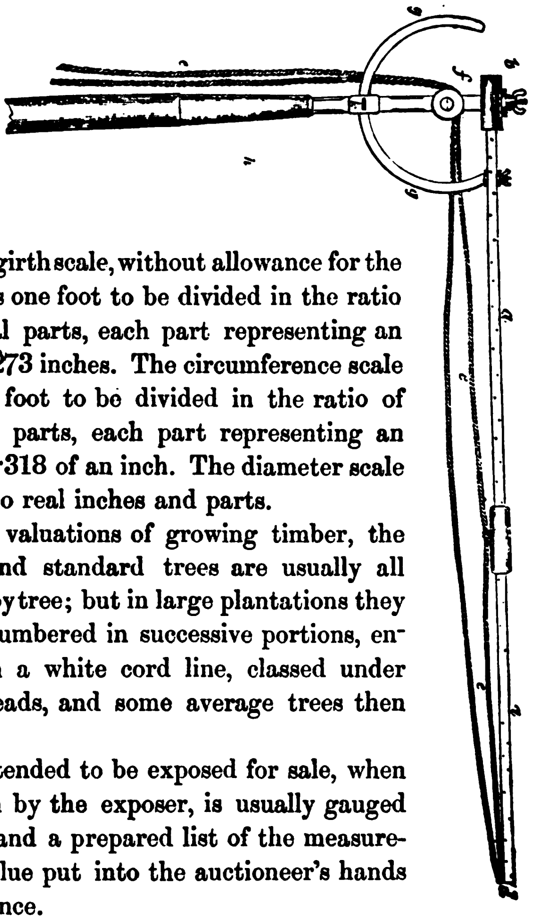
The gauge has also a movable joint upon its handle, by which it can be placed square to any limb or branch, so as to gauge it. The one I have long used has this motion regulated by means of a semicircular piece of ironwork bracing the scale and fixed tangent arms about 3 inches beyond their point of junction, which construction prevents it gauging timber below that diameter.

The same facility of adaptation can be given to the gauge by means of a ball and socket, which are more elegant in appearance, and universal in motion. The semicircle, however, is more useful, as it strengthens the gauge at a point much wanted. Mr Carey, in the Strand, is making one for me, with all the improvements which my experience of defects, and his knowledge of construction, can suggest. On this it is proposed to have decimal multipliers stamped upon the fixed tangent arm, so as to be always at hand when any calculations are wanted on the spot; and the same brass-work is to be made to fit different sets of wooden arms, so as to suit them alike for large or small-sized timber; it being inconvenient to use a large gauge for small trees. I may also notice that, instead of a regular gauge thus constructed, I frequently use one of a more ordinary description, being merely a flat piece of wood 3 inches or so in breadth, for the scale arm; on the under side of which the divisions for the quarter girth are marked with strong black lines right across it, and having a fixed tangent arm nailed upon one end of it, into a round short rod fitted for a tin tube, by which it can be sent up to any height by means of other rods. By applying it to the tree, and the observer standing so as to look square past it, the division which cuts the opposite side from the fixed tangent arm can be ascertained, and read off, although not so correctly as when the perfect instrument is used.

I have them also made in a rough manner, with all the scales on them, and the slipping arm to move by the hand, and which are useful for gauging timber when lying on its side, being so much quicker than the ordinary way; and such a mode will be found useful by all artificers who work with rough or unsquared timber, as their common rectangular square might be readily fitted for the purpose.

The divisions for the quarter girth scale, allowing for the bark, are found by dividing one foot in the ratio of 8·64 equal parts, each division being 1·388 inches; and such divisions, when the gauge is applied to a tree, are representatives of the real inches of its quarter girth when rectified, as formerly noticed, for the allowance for the bark; but it is obvious that this scale can be so varied as to make any other allowance which may be customary in different districts; and when 1·388 is subdivided into four equal parts, the half and quarter inches are shewn.

1



The quarter girth scale, without allowance for the bark, requires one foot to be divided in the ratio of 9·425 equal parts, each part representing an inch being 1·273 inches. The circumference scale requires one foot to be divided in the ratio of 37·698 equal parts, each part representing an inch, being 0·318 of an inch. The diameter scale is divided into real inches and parts.

In making valuations of growing timber, the hedgerows and standard trees are usually all gauged tree by tree; but in large plantations they are usually numbered in successive portions, enclosed within a white cord line, classed under respective heads, and some average trees then gauged.

Timber intended to be exposed for sale, when not cut down by the exposer, is usually gauged by the tree, and a prepared list of the measurement and value put into the auctioneer's hands for his guidance.

Explanation of Figs. 1, 2, 3, *the same letters referring to the same parts of the figures.*

Fig 1. shews a side view of the gauge.

a a, Scale arm of box, lance, or any kind of elastic wood, defended on the edges with slips of thin brass plate, to allow the movable tangent arm to slide upon more easily.

b, The fixed tangent arm. *c*, The movable tangent arm.

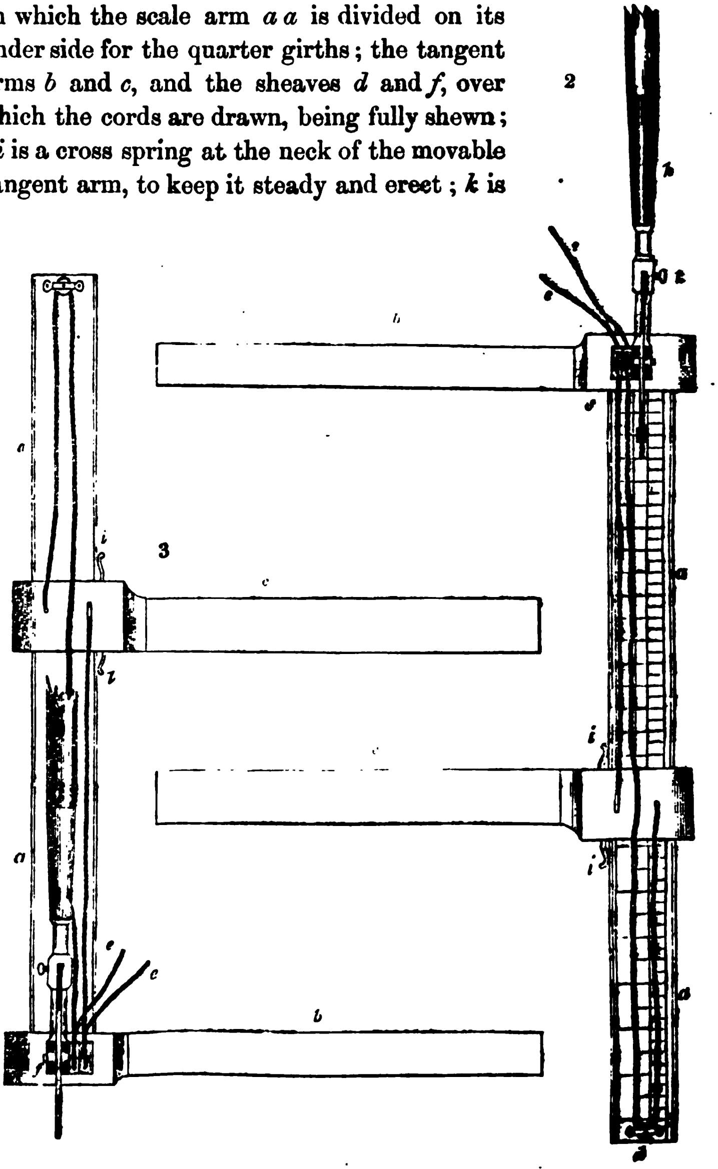
d, A sheave over which the cord *e e* is drawn to move the tangent arm *c*. There is a double sheave placed on the side of the movable joint *f*, over which the cord is also drawn.

e e, Cord for drawing the movable tangent arm *c* close upon the tree. *f*, Movable joint.

g g, *Fig.* 1. semicircular guide of iron or brass, to fix the scale and tangent arms square, when gauging branch wood.

h, Socket of iron or brass, with a screw worked on the inside, for infixing a rod of any length required.

Fig. 2. shews a horizontal view of the gauge, on which the scale arm *a a* is divided on its under side for the quarter girths; the tangent arms *b* and *c*, and the sheaves *d* and *f*, over which the cords are drawn, being fully shewn; *i i* is a cross spring at the neck of the movable tangent arm, to keep it steady and erect; *k* is



a screw for fastening the arms of the gauge either square or at any angular position required.

Fig. 3. is also a horizontal view, being the reverse of Fig. 2.

Table of Multipliers.

(Stamped on the fixed tangent arm, *b.*)

Quarter Girth.	Solid Feet for one foot in length. Multipliers.	Quarter Girth.	Solid Feet for one foot in length. Multipliers.	Quarter Girth.	Solid Feet for one foot in length. Multipliers.
Inches.	*Ft. and dec. parts*	*Inches.*	*Ft. and dec. parts.*	*Inches.*	*Ft. and dec. parts*
1	·007	17	2·007	33	7·563
2	·028	18	2·250	34	8·028
3	·063	19	2·507	35	8·507
4	·111	20	2·776	36	9·000
5	·174	21	3·063	37	9·507
6	·250	22	3·599	38	10·024
7	·340	23	3·673	39	10·563
8	·444	24	4·000	40	11·111
9	·563	25	4·340	41	11·673
10	·694	26	4·694	42	12·250
11	·840	27	5·063	43	12·840
12	1·000	28	5·443	44	13·444
13	1·174	29	5·840	45	14·063
14	1·361	30	6·250	46	14·694
15	1·563	31	6·673	47	15·340
16	1·777	32	7·108	48	16·000

ON THE DISEASES INCIDENTAL TO OUR MOST USUALLY CULTIVATED PLANTS. NO. V.

By George W. Johnson, Esq., Corresponding Member of the Maryland Horticultural Society, &c.

Mildew or Rust.—Of all the other diseases which attack our cultivated plants, not one is so destructive as the mildew. It is the plague of our wheat crops; and as this fatal distemper is always lurking in some district of climes warmer than our own, so the mildew is always in our fields waiting for circumstances favourable to its outspread, and ready to destroy the expected harvest of the husbandman. So constantly present is this destructive disorder, that in the fairest fields of wheat, grown in the richest corn districts of England, and in the most genial years, I never saw a single acre entirely uninfected. Every year the farmer is more or less injured by this disease, for the produce of each acre of wheat is unquestionably reduced annually several bushels. Yet those who suffer most by the loss, the farmers themselves, are almost universally ignorant of the fact; and their attention is rarely arrested by it till a year occurs in which their crop of wheat is nearly annihilated.

Its prevailing injurious nature was well known in an age as distant as that of the Hebrews; and it had not spared the Greeks and Romans. Even the poets, as Horace in his Odes, speak of it as the " Sterile Rubigo" (Carminum Lib. 3, Ode 23), and warning voices have not been since wanting to speak loudly of its ravages. Mr Marshall says, " a certain prevention of the mildew would be a discovery worth millions to this country;" and many others have coincided in this estimate of its injuries.

A little book has lately been published with this terse title, " Think;" and if it succeeds in causing people to make that mental exertion, it will be one of the most valuable pen-births that has ever come into the world; for in my intercourse with mankind, and with farmers in particular, this is an effort of mind in which I have too generally found them lamentably deficient. We are more or less the slaves of habit:—" Man," says Paley, " is a bundle of habits;" and this mischief is the consequence, that we too often act mechanically; adopting practices merely because our predecessors pursued them, and not because they are sanctioned by reason. It positively required an act of Parliament to prevent the farmers of Ireland attaching their horses to the plough by the tail. The want of thought in farmers cannot be more apparent than in their neglect of attention to the disease I am now considering. I have already noticed its annual universal presence; and do not go too far when I say, that scarcely one wheat plant in a hundred can be found that has not about it a spot of mildew. This disease is known to be the effect produced by a minute fungus, belonging to a genus closely allied to that which causes the smut, and described in my last paper. The roots of this fungus penetrate the vessels of the plant, and are nourished by the sap intended for perfecting its seed; consequently, if the fungi are so numerous in each stem, as to make it a marked " mildew year," the grain is either partially or totally shrivelled, owing to the roots of these parasites intercepting the sap in its upward passage.

I have little doubt that in the best of years, and in the most healthy crops, the produce is diminished one-tenth by the mildew. This is a startling assertion; but if any one who is competent to detect the infecting fungus, will examine a wheat crop, I have no fear but that the result of his research will substantiate my statement.

The ignorance relative to this disease is not a consequence of its novelty. It is not, like the American blight, a malady recently occurring to our crops, but was known and dreaded in the earliest ages to which our knowledge extends. Thus, when God held out as a warning to the Israelites, the afflictions he would bring on them if disobedient, he enumerated the pestilence and the sword to destroy their persons; "with blasting and with mildew" to lay waste their fields (Deut. xxviii, 22; 1 Kings viii, 37; 2 Chron. vi, 28); and when the same Almighty Being had punished that rebellious people, he reminded them by his prophet, "I have smitten you with blasting and mildew; when your gardens and your vineyards, and your fig trees, and your olive trees increased, the palmer worm destroyed them," (Amos iv. 9). "I smote you with blasting, and with mildew, and with hail in all the labours of your hands," (Haggai ii. 17). The Hebrews called it *yarcoon*, implying a yellow pallidness arising from moisture.

To the Greeks it was known as *Erusibe* (ἐρυσίϐη), and Theophrastus, who wrote his "History of Plants" about 320 years before the Christian era, observes (Lib. viii. c. 10) that it occurs more frequently to corn than to pulse; that, in the climate of Greece, barley was more subject to it than wheat, and particularly a variety then known as Achillean barley. Experience had taught them, that the crops on high lying lands were seldom attacked by this disease; but that the hollows surrounded by hills, where winds could not get at the crops they bore, were most frequently infected. It is chiefly generated, concludes Theophrastus, during the full moon.

By the Romans the mildew was denominated "*Rubigo*." Pliny informs us in his "History of Plants" (Lib. viii. c. 28

and 29), that it was the prevailing opinion, that this disease arises from certain dews settling upon the corn and obtaining a caustic or burning quality from the intense heat of the sun. This naturalist himself thought, on the contrary, that the disease arises from cold, considering that infection first occurs during the absence of the sun, and always about the new or full moon. Pliny, and the still later writers of the Geoponica, for this work is composed of fragments of Roman writers living after the removal of the seat of empire to Constantinople, though written in the Greek language, considered that the best remedies were stinking, purgent smokes; hence they recommended fish, horns, goats' dung, &c., to be burned on such side of the field as would enable the wind to diffuse the smoke over and throughout the crop. They evidently had the same prejudice as is now entertained by our own farmers, that the mists which frequently prevail during mid-day in the hottest periods of summer are the cause of the mildew: for they direct these fumigations to be performed at such time as it is seen in the atmosphere. They also thought that if branches of the laurel were fixed among their corn, the mildew would pass from the crops to these branches.—(Geopon. lib. v. c. 33. Plinii Hist. Plant. lib. xvii. c. 17, &c.) One of their practices recommended is much more rational, namely, to bruise the leaves or roots of the colocynth, to macerate these in water, and, before the sun had risen, to sprinkle the infected crop with the liquor thus obtained. It is possible that the juice of the colocynth, which is violently purgative to the human system, may be destructive to the fungus constituting the disease. It approaches to that which in modern times has been found the only effectual curative treatment; and the direction that the application should be performed in the morning, evinces that it was a direction suggested and confirmed by experience. Columella (lib. ii, c. 12) says, that hoeing corn during wet weather is apt to induce mildew.

Some modern writers have considered that the rubigo of the Romans is the disease known to us as the smut, but independent of the name, which evidently referred to the red or rusty hue of the disease, and which is no characteristic of the last-named disorder, we have the direct testimony of Virgil (Geor.

i. 150) that the rubigo was a disease of the straw; his words are,

> "Mox et frumentis labor additus: ut mala *culmos*
> Esset Rubigo," &c.

Horace (Carminum Lib. 3, Ode xxiii) and Ovid (Fast. iv. 907) speak of the same vegetable epidemic.

The Greeks and Romans were as conscious as the Hebrews of the destruction it would inflict on their crops. They considered it as the instrument of vengeance directed by a particular deity, to whom they applied the same appellation as to the disease itself, (Schneider's Scriptorum Rei Rusticæ, vol. i. pt. 2, p. 246). To propitiate this presiding deity, a festival entitled *Rubigalia*, was instituted by Numa in the eleventh year of his reign, that is 704 years before the birth of Christ. It was celebrated annually on the 25th of April, in the neighbourhood of a grove, at the fifth milestone on the Claudian way, and comprised sacrifices, races, and obscenities. Reddish-coloured bitches (rufæ canes) were sacrificed, because the lesser dog-star was then in the heavens, and was considered unpropitious to corn.—(Pliny, Hist. Plant. lib. xviii. c. 29; Verii Flacci Faste. p. 63.) Ovid, who enters fully into the religious performances of the festival, says, that the limbs of a sheep and the entrails of a dog were offered as a sacrifice on the occasion; and that the priest informed him that he knew of no reason for the latter animal being sacrificed, but that its name coincided with that of the constellation, which at that season was apparent in the sky.

The prayer addressed by the priest to the presiding deity, marks so strongly their knowledge of the extent, and inducements of the disease, that I shall give a nearly literal translation of a part.

> "Oh, blighting Rubigo, spare the corn plants,
> And let the ear wave gently o'er the surface of the earth;
> Suffer the crops which have been nourished by the propitious
> Stars of heaven, to grow, until they become fit for the sickle.
> Thine is no small power: the crops thou hast marked
> The dispirited cultivator reckons as lost.
> Neither winds, nor showers, so much injure the corn;
> Neither when bitten by the frost does it acquire a hue so pallid,
> As, if the sun fervently heats the moist stalks;

> Then, Oh ! dread Goddess, is the opportunity for thy wrath ;—
> Be merciful, I pray, and withhold your rusting hands from the crops ;
> Nor harm the cultivated land : it is sufficient to be able to do harm."

The misty weather mistaken by the Roman cultivators as actually a cloud of mildew, is only one of many numerous instances which might be quoted where causes of the disease have been considered to be the disease itself. To enumerate these would form a long catalogue of mistakes; yet these I should not hesitate to detail, because the refutation would incidentally introduce much useful information, but that they will for the most part be introduced among the circumstances which promote the occurrence, and aid the progress of this epidemic.

The first person, I believe, who correctly pointed out the nature of mildew was Felice Fontana, who, in the year 1767, published at Lucca, a very particular description of the fungus occasioning it, in a work entitled " Observazione sopra la Ruggine del grano." Since then it has engaged the attention of many botanists, and the results of their researches have been to establish it as a distinct species of fungus, though they differ as to the genus to which they attach it.

It is the *Puccinia graminis* of Persoon's Disp. t. 3, f. 3. Mong and Nestler, n. 675; Greville's Flora Edinensis, 433. Hooker's, Smith's Eng. Flora, v. pt. 2. p. 363; and it is the *Uredo frumenti* of Sowerby's Bot. t. 140; Banks in Annals of Bot. ii. 51; Purton's Midland Flora, ii. 1128. It grows on the leaves and stems of wheat, &c.; appears in dense, diffuse tufts; often confluent, forming long parallel lines on the culms; at first brownish-yellow, but changing to black. Sporidia elongated, clavate, very slightly constricted at the septum; upper cell the shortest; stipes filiform. It must not be confounded with another parasitical fungus, which is common upon the wheat leaves and culms, but which is not so injurious; namely, *Uredo rubigo*, De Candolle's Flora Franc. 6. p. 83; *Cæoma rubigo*, lk. sp. 2, p. 4; Hooker's Smith's Eng. Flora, v. pt. 2. Spots yellow; heaps oval, scattered, generally epigenous; epidermis at length bursting longitudinally; sporidia sub-globose; red-brown; easily dispersed. Those who would like to consult drawings of the *Puccinia graminis*, may find them in Sowerby's Botany already quoted, and in a pamphlet published in 1806 by Sir Joseph Banks, entitled " A short account of the disease called the Blight, the Mildew, and the Rust," from which almost all subsequent drawings have been copied. If the straw of wheat be examined with the assistance of a magnifying glass, its striped surface will be seen to arise from longitudinal partitions of the outer bark or epidermis. The depressed partitions are furnished throughout their length with one or two rows of pores or orifices, which seem capable of emitting or imbibing moisture as the wants of the plants may require. Similar pores, though varying in form and arrangement, pervade the leaves, and chaff or glumes, and it is in these pores that the seeds of the parasitical *pucciniæ* obtain admission, and, vegetating in the cavities to which they lead, doubtless thrust their minute roots into the cellular texture beneath the bark, and intercept for their own nourishment, that sap which should proceed to the grain for its development and completion. The corn necessarily becomes shrivelled, proportionately as the fungi are more or less numerous on the plant; and as it is the nutriment that would have perfected the interior of the grain, which is chiefly abstracted by the fungi, for the exterior form is nearly completed before the mildew occurs, the proportion of *flour* to *bran* is always much reduced. Sir J. Banks observed in 1804, which was a " mildew year," that some of the wheat would not yield from a sack so much as a stone of flour.

Sir Humphrey, then Mr Davy, placed the loss caused by this fungus beyond a doubt, by chemical analysis. He found that 1000 parts of

		Flour.	Bran.
Thin-skinned *Sicilian Wheat* afforded of	*Gluten*, 239 *Starch*, 722	=961	39
Middlesex Wheat (average crop),	*Gluten*, 190 *Starch*, 765	=955	45
Spring Wheat, . .	*Gluten*, 240 *Starch*, 700	=940	60
Mildewed Wheat of 1804, .	*Gluten*, 130 *Starch*, 520	=650	350
Mildewed Wheat of 1806, .	*Gluten*, 32 *Starch*, 178	=210	790

Shewing, in one instance, a loss of 31 per cent. of flour in the mildewed, when compared with the average English wheat, and in the other of nearly 75 per cent. (Davy's Elem. of Agricul. Chemistry, 150.)*

I have almost always been able to detect the *puccinia* upon the lower part of the culms, generally on the *folia vaginans* (shoot blade), early in June; but it is not till the following month that the season determines whether the ravages of this fungus shall be more than ordinarily extensive. Throughout July the farmer should scrupulously, and almost daily, examine his wheat crop, especially that which appears strongest and most luxuriant; and if he detects any considerable number of tufts of the fungus upon the stems, must lose no time in using those curative measures which will be detailed in the conclusion of the paper. If July is hot and dry, it may be concluded, without much fear of disappointment, that there will be but little injury incurred by the mildew. The reason of this is very apparent; for in such a season no fungus will vegetate vigorously. This order of plants invariably delights and flourishes in a moist atmosphere, and in a subdued light, accompanied by gentle warmth. A *muggy* season is the most expressive term to describe that wherein the mildew vegetates most rapidly. In such seasons, likewise, it unfortunately happens that the wheat plants remain longest succulent, their pores expanded, and their fibres relaxed; circumstances peculiarly favourable to the admission of the seeds of the fungus, to their vegetation, and to the penetration of their roots. That it is in such seasons the *puccinia* vegetates most rapidly and extensively, is supported by the observations of others; for although they consider such a season as the actual cause of the mildew, their testimony is equally valuable, though from it they have drawn erroneous conclusions. Thus, M. Duhamel says, that the mildew is caused by mild, hazy, or gloomy weather, while the corn is at the height of its vegetation; that is, about the time of its blooming. When a hot sun has succeeded such weather, he observed the wheat crops mildewed in a few days. He always observed wet springs very inducive of this disease; but it rarely occurs in clear, dry, hot years.*

---

* Mr W. Jones of Wilmington, Somersetshire, found that wheat, partially mildewed, produced one-fifth less of flour than that not affected.—(Communications to Board of Agriculture, V.)

The Abbe Rozier, in his "Dictionary," observes that it is "caused by the drops of fog or dew, dissipated by a hot sun;" an opinion which is the echo of Ovid's verses, forming part of the Flamen's prayer for the preservation of the Roman crops from this disease—

> "Quantum, si culmos Titan incalfacit udos;
> Tunc locus est iræ Diva tremenda tuæ."

And such a season, as I have before observed, has a damp atmosphere; which, above all other states of the air, is favourable to the vegetation of the *puccinia*. There is no doubt also that in such seasons vegetables are more than ordinarily weak, and prone to disease. "The application of cold water to any plant," says Mr Knight, "on which the sun is shining strongly, is very injurious to its health, and therefore likely to give increased activity to any disease to which the plant is subject." This observation follows the detail of an experiment, in which he found, that sprinkling wheat plants, growing on ground very dry, with cold water in the afternoon of a warm bright day, caused them to be extensively mildewed. "A considerable absorption, therefore, probably took place; and to this absorption, and the effects of a sudden change of temperature, as secondary causes, I am disposed to attribute the appearance of the disease; but whether the seeds of the mildew were carried into the pores of the plants by the water, or existed there before, is a question which I shall not attempt to solve." (Banks on the Blight in Corn, p. 30.)*

---

* One or two writers have given to me such incomprehensible theories of the cause of mildew, that I must put them in a note, without further comment. "A Lincolnshire Farmer," in the "Annals of Agriculture," says, the cause is "mild winters, and the inflammation of oxygen gas at the eve of harvest;" and Dr Lewis, in the same work, considers that corn is mildewed probably by the atmosphere being "phlogisticated;" and proceeding in his *explanation*, he adds, "The atmosphere, particularly in summer, being loaded with putrid effluvia, so as to be incapable of attaining the height necessary to undergo the chemical process of putrefaction by the action of the vitriolic, nitric, and muriatic particles with which the air of the lighter regions is charged, and therefore it descends in that undepurated and unwholesome fluid we call mildew." Did the Doctor understand what he meant himself?

Mr R. Somerville concluded that the mildew originates from the attacks of insects introduced with the manure (Communication to Board of Agric. ii. 200); but he evidently intended, by his descriptions, the minute acarus (a species of louse), which is almost always to be found upon decaying vegetable matter; and, in the cases of mildews, this insect is the follower, not the introducer, of the disease.

The observations of Mr Marshall, which were the results of long experience in many counties of England, coincide with the preceding. "In a dry, warm summer," he remarks, "which is well known to be favourable to the health, vigour, and productiveness of the wheat crop, the seeds of the fungi are harmless, so long as the fine weather continues. On the contrary, in a cold, wet season, which gives languor and weakness to the wheat plants, few crops escape entirely. A succession of cold rains, while the grain is forming, is very inducive." Mr Marshall perversely concludes that "the fungi are an effect, not the cause, of the disease;" an error which is at once refuted by the fact, that, if the fungi are all removed from a plant, it is speedily cured.

Of other circumstances favourable or unfavourable to the occurrence or exasperation of the mildew, little need be said, because they have comparatively little influence upon its occurrence. All soils and situations are liable to its incursions; for it is, in the fullest sense of the term, epidemic. The soil on which it appears rather the most rarely, is a tenacious clay; and that on which, when it does occur, its ravages are most extensive and destructive, is the light, calcareous, and rich. (Chatterton, a Lincolnshire Farmer, in the 44th vol. of the Annals of Agriculture, A. Young, Marshall, &c.) "As far as my observations extend," says Mr Egremont, "the soils wherein clay predominates, have yielded crops the least affected by the mildew. The soils most liable to have their crops injured, particularly that of wheat, are the following, and in the order stated:—Peat or moor, calcareous, calcareous loams, sand, sandy loams, and another kind not found in any great breadth, but in patches, chiefly, but not exclusively, in clayey soils. The practical farmer calls it *grey earth*." (Egremont's Observations on the Mildew, p. 3.) The slightly superior power of clayey soils to protect the crop growing upon them from being the most severely affected by the mildew, probably arises from the temperature of such soils being less liable than lighter ones to sudden vicissitudes of temperature. Dr Hales found, in the month of August, when the temperature of the air and of the surface of the soil were 88°, that the temperature of the soil 16 inches below the surface was 70°. In October, when the air and surface were at 35°, the temperature at 16 inches beneath was 48°, and at 24 inches, 50°. This statement led me to make a few experiments upon the comparative rapidity of cooling; or, in other words, the power of retaining heat, of various soils; and I invariably found, that the mercury in a thermometer, whose bulb was buried equally deep in a siliceous, as those of others were in a calcareous and in an aluminous soil, rose most rapidly, and that in the last named, most slowly. Their rapidity of cooling followed the same order. Some experiments, substantiating the same fact, will be found in Sir H. Davy's Agricultural Chemistry, p. 179. Every gardener knows the injury his plants sustain from sudden vicissitudes of temperature. "Whatever has a tendency to check a quick and great loss of heat in the substances which surround such vegetables, particularly their roots, will be best calculated to save them from that injury, and from vegetable death; consequently, those earths which are the worst conductors of heat, or, in other words, are the longest in heating or cooling, will be the most favourable in resisting any sudden alteration; and the vegetable growing on them will be the least injured when so assailed." (Egremont's Observations on the Mildew, p. 30.)

---

* There is no difficulty in accounting whence the seeds of the fungi came; for Mr Knight records, in the previous page, that other wheat plants close by were extensively mildewed.

Situation appears to have rather more tutelary power than the soil, since I have invariably found the wheat growing in fields lying in closely enclosed valleys, more frequently and more seriously injured by mildew than those upon elevated exposures. "A Lincolnshire Farmer," Mr Lambeth, and other writers in the forty-fourth volume of the "Annals of Agriculture," agree in this observation; and it is no more than might be anticipated from our knowledge of the habits of the fungus tribe; such situations being always more damp, and subject to a moist, foggy atmosphere.*

All *varieties* of wheat are liable to the disease, but the *white* is always the earliest affected, and the bearded or rivet the last. This may arise from the latter variety having a firmer epidermis, arising from its containing a little more silex, and thence having its pores less easily acted upon by atmospheric changes, and consequently less liable to the entrance of the seeds of the fungi. Moreover, the hardness of the epidermis checks their rapid outspread when vegetating.

Mr Sers considered spring sown wheat not liable to this disease of the mildew, and that is the general opinion in South Holland. (Commun. to Bd. of Agri., v. 182.) Other authorities deny that spring wheat is exempted from it; and to this opinion I incline, in the absence of any thing like decisive knowledge on the point.

Early *sowing* is advisable, because the wheat plants, by this means, have a chance of passing the time of blooming before they are extensively attacked; and the more advanced the growth of the seed, the more is it out of the power of the parasite to check its perfection. Another reason suggested by Mr W. Jones of Wilmington, in Somersetshire (Com. to Bd. of Agric., vol. v.), is, that, when sown late, the plants are green and sappy in July, and even at the commencement of August, the season in which the cold and frosts occur, that are so inducive of the disease; and this green state necessarily renders them more than ordinarily liable to suffer by such a reduction of temperature. On this account it is that, in superluxuriant crops, and plants growing upon dunghils, the former are liable to, the latter almost always are infected by, mildew. Yet the time of sowing is no unfailing preventive; for in "mildew years," all crops are attacked; and instances have occurred where, in fields sown in September, October, and November, the first and the last have been most injured.

The *berberry* has been anathematized as a source of this vegetable pest; but I have never yet met with any facts which establish the charge. It is true that Rolesbury, in Norfolk, is locally known as "Mildew Rolesbury," and that the *berberry* abounds in the neighbourhood of that village; but I know many low lying arable districts, proverbially liable to the mildew, having no *berberries* in their vicinity. It is true that a band of mildew has been traced across a field of wheat from a *berberry* bush growing in one of its hedge-rows; but then I have seen a similar track of the disease commencing from an oak. It is also true that the late excellent President of the London Horticultural Society found wheat, sprinkled with water in which berberry branches had been washed, speedily become infected with the mildew; but he also ascertained that wheat, similarly sprinkled with clear water, became similarly diseased. I have tried many experiments, with a view to ascertain the truth or error of this suspicion, but have not succeeded. However, I am convinced that the parasite which affects the berberry, is not the *Puccinia graminis:* the *sporidia* are dissimilar, and the colour totally unlike; but it may be, and certainly very much resembles, the *Uredo rubigo.* It is no objection to say that the identity is unlikely, because the plants attacked are so widely distant; for, as already noticed, these parasites will vegetate on very various, and even dead vegetable matters.

---

* See the observation of Theophrastus, ante, p. 255.

The age of the seed, the thickness of sowing it, and previous or subsequent cultivation, appear to have no preservative influence; therefore, it now only remains to consider whence the seeds of the fungi come to the crop, which will lead to a consideration of the modes of prevention; and, lastly, whether there is any practicable cure.

There seems to me little doubt, that the fungus is communicated from the soil to the crop. It is certainly not conveyed thither with the seed-corn, for no washing, no cleansing, or pickling of this, has ever been observed to have any effect. In "mildew years," all fields of any infected district are affected; and when it is only partial, one end, or a breadth across the middle of a field, of which the seed has all been treated alike, will be grievously injured, whilst the other parts suffer little more than ordinarily; for, as I have previously noticed, every year, and in all fields, the mildew is partially present. There is little difficulty in accounting for this. Every *puccinia* sheds some hundreds of seeds, more minute and lighter even than those of the puff-ball, and as every wheat-crop annually produces some, these are wafted over neighbouring closes by every wind during their seeding-time, which is chiefly in the months between May and October. In the soil upon which those seeds alight, they attach themselves to the stubble, or other matters, and vegetate, reproducing seeds, or remaining without germination until the following spring. In either case the seeds of the *Puccinia* are in the soil, and may be communicated to the wheat plants the same autumn, though it is more probable they vegetate upon other substances contained in the soil, and have their seed communicated to the crop during the following spring. This fungus has also the characteristic of spreading by stooling, or throwing out offsets. This may be seen if its progress is watched upon any culm which it affects. I once placed, in a paper box, some pieces of straw that were more completely mildewed than any I had before observed; this was left during the whole winter in a closet, which at this season is unusually damp. Upon opening the box, in the spring following, I found the *puccinia* had grown, and spread in various rectilinear forms, upon one of its sides and upon the bottom, a fact which I remember to have seen confirmed by a statement in one of the volumes of the Quarterly Journal of Science. The fungus, then, though its natural habitat is the culm of the wheat, will vegetate upon other vegetable bodies, and this satisfactorily explains the mode in which it may, after being preserved through the winter, be conveyed to the succeeding year's crop,—to say nothing of those seeds which may be attached to the straw of the preceding year, and be conveyed to the next year's crop by various modes.

These facts demonstrate that *prevention* is impossible; for however careful a farmer may be to avoid every source from whence the seeds of the *puccinia* may arrive, yet every summer wind may waft them to his crops from other, even far distant, lands. To prevent the communication to the wheat from the soil by the stooling, or spreading power of the fungus, it will be well to sprinkle the surface with salt, immediately after sowing, at the rate of five bushels or six bushels to the acre; and in the spring, early in May, to apply, in a similar manner, about the same quantity of caustic fresh-slacked lime,—applications which are not only destructive of the *puccinia*, but also of slugs, and promotes the general health of the crop.

For testimonies to the power of common salt to prevent, in some instances, the occurrence of mildew, I would refer the reader to my brother's "Essay on the Uses of Salt," p. 51–56, where will be found the concurrent evidence of Sir John Sinclair, Mr Sickler, Rev. R. Hoblyn, Mr S. Robinson, Mr Wood, and Dr Paris.* Salt, if not a complete preventive, is an effectual cure of the mildew. Mr Chatterton, a Lincolnshire farmer, says, in the 44th volume of the "Annals of Agriculture," that "on the sea-side the wheat is little damaged by the mildew, yet within three miles inland, the crops are as much affected as those still further from the sea." This fact can be supported by the experience of most farmers whose fields skirt our native shores; and unquestionably it is owing, not only to the soil containing a greater proportion of common salt than is to be found in more inland soils, but because the sea haze, which rises almost nightly in the summer season, bathes, as it were, the crops in the immediate vicinity of the coast, and this haze holds in solution a portion of salt.

The following well-attested communication from the late Rev. Edmund Cartwright of Hollenden House, near Tunbridge, is conclusive on this subject, and gives full directions to the farmer how to apply, and at what expense, a practical remedy. I extract it from my brother's "Essay on the Uses of Salt," p. 49, 2d edition.

"I and a neighbour of mine have applied it as a remedy for the mildew in wheat, with the most unequivocal success. I first made the discovery about two years ago. My experiments at that time were upon a very limited scale. They have this year only extended over an acre and a half, but under circumstances that leave not a shadow of a doubt of salt being an absolute specific for mildew, in the most aggravated stages of the disorder. Of this I will state to you a convincing proof. In the year 1818, I found a few ears of wheat, which I conceived to be a new and improved variety. From these ears I raised as much wheat as last year planted a piece of land 4 feet wide, and 100 yards in length. The produce I had promised Mr Coke, and to augment that produce, I had the ground, previously to planting, highly manured; and as soon as the wheat came up, I gave it a good dressing with soot, and this dressing was repeated once or twice. In consequence of this superabundant dressing, the wheat, as might indeed have been expected, was as rank as the wheat you may observe growing accidentally upon a dunghil, which never fails to rot upon the ground, without bringing a single grain to maturity.

---

* Mr Prevost, quoted by Sir John Sinclair, states that the sulphate of copper, if dissolved in water at the rate of 3¼ oz. to the gallon, forms a solution which will prevent the attack of mildew upon the wheat plants arising from seed which has been steeped in it. I am afraid it has no such power.

"The mildew made its appearance on this particular part of my field, while the straw was quite green, and the grain in a milky state. Notwithstanding the danger that might be apprehended to the wheat itself, from its being thus succulent, I ventured to give it a dressing with salt and water. As a heavy shower of rain fell a few hours afterwards, the dressing was repeated the next morning.

"The proportion of salt to the water, one pound in a gallon, laid on with a plasterer's brush, the operator bearing a pail of the mixture in one hand, and the brush in the other, making his casts as when sowing corn; or else with a common watering-pot, which, being swung with great force, throws the water very rapidly. Two men will get over about four acres a-day, the one to spread, the other to supply the mixture.

"The result was, that the mildew was completely subdued, and the wheat went forward to maturity, and although the sample was not so bold as it might have been, it was sound and marketable. In other parts of the field, where the mildew shewed itself, not under the aggravated circumstances described above, but as it usually appears, the wheat was not in the least injured by it, after the salt and water were applied; it was indeed as fine a sample as could be grown. Both mine and my neighbour's wheat were examined by many practical farmers, who are so decidedly convinced of the efficacy of my remedy, that they intend never to be without a reserve of salt, ready to meet the enemy the moment he appears.

"The effect of the salt upon the mildew, to those who do not consider the manner of its operation, is truly astonishing; I believe it to be instant death to the fungus; this, however, is certain, in less than forty-eight hours the straw nearly recovers its original colour and brightness. The certainty and celerity of its operation, I account for thus: The mildew, it is now well ascertained, is a parasitical plant, of the fungus tribe, the principal constituent of which is water; when salt, therefore, is applied to them, the aqueous particles are immediately absorbed, and their vitality destroyed. The action of salt upon mushrooms, as in making mushroom catsup, confirms this theory."

I can afford decided testimony to the efficacy of the cure recommended by Mr Cartwright; but I would add these precautions. The safest quantity of salt per gallon is eight ounces, and then the application may be rendered more effectual by frequent repetition, without any danger of injury to the plants. If the application is not made during a clouded day, it is best to defer it until the evening.

Some have recommended a rope, held at its extremities by two men, to be drawn up and down each ridge of the infected crop, to remove the fungus; and there is no doubt that this treatment is partially effectual, for the parasite is removed wherever it comes in contact with the rope, but the points of contact necessarily are limited.

ON THE STRUCTURE OF SMUT-BALLS IN WHEAT.

By Mr John Lawson Jun., Elgin,

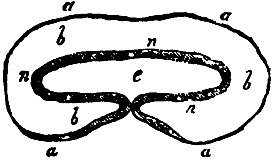
Much has been said and written on *Smut* in grain, and various causes have been assigned for so destructive a disease. Yet I have not observed that any one has given a description in this useful Journal of the various appearances which a *smut-ball* exhibits during the different stages of its growth. This malady *begins as early as the formation of the ear of wheat*, and in order to trace the disease, it is necessary to begin our investigation as soon as the ear is formed within the wheat plant. It is not intended at present to give an account of smut, as exhibited in barley or oats, or even that variety of it which destroys the *whole* ear or spike of a wheat plant. The chief object of this paper is,

1st, To describe the appearance of a *smut-ball* through the various stages of the disease; and,

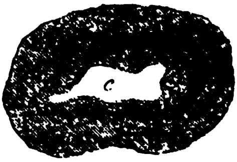
2d, To offer a remark on the cause of a smutty crop producing smutted grain when again committed to the earth.

1st, Whatever may be the opinions of the agriculturist with regard to the *cause* of smut, it must surely be of no small importance to him to obtain a correct description of the *forms* which a smut-ball assumes during the various stages of its growth, for though the acquisition of facts may overturn theory, it can never stop the progress of knowledge. I have examined the disease during its various stages, and the description submitted is made from actual observation. In a wheat plant producing *smut-balls*, the disease appears to be confined chiefly to the interior of the flower. The calyx and corolla are not much changed by it, except in colour, which is of a peculiar green. The structure of a smut-ball will be best understood by comparing it with a sound grain of wheat: fig. 1 represents a transverse slice of a sound grain of wheat taken from a plant in that stage of its growth, when the anthers of the stamens have just protruded beyond the corolla. In the interior of this transverse slice is an open empty space *e*, which is surrounded by a greenish-coloured border *n n n*, which lines the interior of the whole cavity. As the plant advances to maturity, this open empty space *e*, and the border *n n n*, contract, and the part lying between these and *a a a*, the exterior of the seed, becomes filled with that milk-like substance which afterwards forms the flour of wheat.

1



2



3

4

5

6

Next, let us examine a transverse slice of a *smut-ball* when the stamens become fully formed within the corolla; for be it observed, the anthers never protrude beyond the corolla when it contains a smut-ball. The first thing we observe in this transverse slice, fig. 2, is, that the opening *e*, in the centre of the seed, or rather smut-ball, is surrounded by a *dark green substance*, which, in place of being confined to a thin membrane, like *n*, lining the cavity *e*, as in fig. 1, is found to *extend outwards to-*

the exterior of the seed. In fig. 1 we have a space *b b b*, in which no green matter is to be found; in fig. 2 this space is completely filled with it. The opening *e*, in the centre of the smut-ball, appears likewise to be filling with a greenish matter, which pushes inwards rapidly from the dark green border *o o o*, and quickly fills up the empty space *e*.

In a very short time the whole of the interior of the smut-ball changes from a green colour to white, as in fig. 3. This whitish substance is no sooner formed than it again begins to change. A black speck is first observed in the centre of the smut-ball, and from this point it gradually extends till it fills the whole smut-ball. This process will be observed going on in figs. 4 and 5. In fig. 4 it has just begun; in fig. 5 it has made considerable progress. As the plant still continues to advance towards maturity, the dark green membrane, which surrounds this black powder, becomes itself of a brown colour, fig. 6.

A groove runs along the back of a smut-ball, and the filament of one of the stamens is always found running up this groove, while the filaments of the other two stamens adhere slightly to the sides of the smut-ball. Sometimes, also, the sides of the smut-ball have each a small groove in them, and in each of these grooves the filaments of the stamens found on the sides of the smut-ball run upwards.

In the description now given, the reader will probably have observed, that though a smut-ball is somewhat in the form of a seed, it has the external form only; and that there is one most important point in which it differs from a true seed. In a true seed an opening will be observed at *b b b*, fig. 1, which fills gradually with a *liquid milky substance*, that afterwards becomes the flour of wheat. In a smut-ball, there is no empty space as *b b b*, and no milky-like matter ever flows into it. On the contrary, where this empty space is in a real seed, we find in the smut-ball a greenish substance growing *inwards* towards the centre. This seems to be the great difference in *the earlier stages* of the disease betwixt a true seed and a smut-ball.

2*d*, In animals and vegetables a *tendency* may be observed to produce some *particular structure*, for which they are either prized or considered worthless, according as it tends to some desirable end, or the contrary. A high bred animal has a tendency to impress his offspring with his own peculiar properties. A plant which, by cultivation, has so far got the better of its natural propensity as to produce double flowers, continues by slips and other methods to preserve such a property through succeeding years. The seed of grains, improved by cultivation, presents us often with a new variety, known for its earliness in ripening, thinness of skin, valuableness in mealing, or some other useful quality. Yet neither the tendency which a plant or its seed has to continue a race known for its peculiarities, are acquired in a day. All and each of them are the product of a long-continued tendency. In examining a field of wheat, we find plants in which many of the ears of corn are completely smutted, others in which a part only of the ear is smutted, while in others the disease is confined to perhaps one or two grains. In a plant in which are one or two smutted grains, a tendency to smut (produced by some particular cause) may probably just be commencing and partially exhibiting itself. The seed of this plant is again sown, and again exposed in the soil to the cause of smut; its tendency to smut will thus probably be farther increased, and exhibited in the production of an additional number of smutted grains. In this manner the disease continues to increase, and *smutted seed to produce a smutty crop.*

That the *peculiar structure* of the parts of fructification in a wheat plant, as described at the beginning of this paper, may thus gradually unfold itself and increase, seems conformable to the settled course of nature, and if such be the fact, it is almost superfluous to remind the agriculturist of what importance it is to procure wheat seed from a field in which little or no tendency to smut has been observed.

AIR, ITS USES AND ABUSES, AND VENTILATION.

We have no intention, on the present occasion, to enter upon an analysis of atmospheric air; our readers who are not familiar with its component parts may meet with a scientific treatise upon the subject in various works; our business is with its every-day and every-where utility: for although the beneficial effects of ventilation were urged upon the attention of the community, in earnest and persuasive language, by Dr Darwin, and, since his decease, have been advocated by other writers, we see ample cause to exert ourselves in furthering advice on a subject of such vital importance to mankind in every sphere of existence; but especially in the lowly dwellings of the poor, whether in crowded cities, or in rural districts. Into *every* room, of *every* house, on *every* day (here is a repetition that will assist in retaining the advice in the memory), a free current of atmospheric air should be introduced for the space of an hour at least. There is seldom a day of such entire storm that an interval may not be found in which to effect this necessary ventilation. In the mansions of the affluent, dampness from the admitted air may be counteracted by the means of fires; and even in the cottages of the labourer and the artisan, although no means might be found to correct the humidity that may have entered, the certainty of inhaling fresh and wholesome air, instead of that which has been pent up for hours, and vitiated by the breath of numbers of human beings, with all the concomitants of poverty, and too probably a lamentable lack of cleanliness, will be evinced by the elasticity of spirits and robust health of the inmates. During those occasional absences from a crowded sitting-room, which daily occur in the middle ranks, as well as among the very poor, advantage should be taken, and a thorough airing insured, by setting open the doors and windows. This preservative of health ought to be *especially* attended to in *all sleeping rooms*, particularly in those of the class who most require it, and, at the same time, who, from a variety of causes, are the least able and willing to attend to it: for, not only from want of cultivation of mind are they unable to appreciate the necessity and the value of a constant renewal of atmospheric air, but, from insufficiency of warm clothing and good firing, they shrink from encountering extra cold; and, worse than all, this unfortunate portion of the community are too frequently doomed to dwell in habitations *the windows of which are not made to open!* How many of the contagious disorders which lurk in the resorts of poverty, may be traced to the ignorance and recklessness of man himself!

While, however, we deplore the folly and wickedness that condemn our poor countrymen to live in houses so constructed that the pure breath of heaven cannot enter, what terms of reprobation can we find too strong for the conduct of those who, being better aware of that inestimable blessing (free ventilation), omit to attend to it? Is it possible that they can neglect so great a duty as the preservation of their own health and that of their families, by slighting a boon of such benevolence? Utterly unworthy are such ungrateful natures to enjoy the comforts of social life.

Among the numerous fallacies that go to the formation of our errors, that of the unhealthiness of the night air is one of the most absurd. Exposure to its influence is, in this well drained open country, no more to be dreaded than is exposure to the air of day during the sunlight. That persons with reasoning faculties should suppose they are likely to sustain health better, by inhaling the exhalations from their own lungs and those of other persons for the space (in winter) of nearly twelve hours, than by leaving a window unclosed, to admit a continual change, is to us incomprehensible. We would not recommend that a draught of cold air should stream down upon a sleeper beneath a window, nor assuredly that a fierce wind, or falling rain or snow, should beat in upon a bed; but certain we are that the healthiest old lady in our acquaintance sleeps the whole year round close to a window *wide open*, and that she has repeatedly shaken the snow from off her coverlid! We ourselves, stopping far short of such heroic exposure, seldom find the night so cold and stormy that we require to close our window; and during the summer months we rarely omit to let in a current of air throughout the nights at two windows. This healthful practice we have maintained for more than twenty years, whether "in populous cities pent," or dwelling among the fragrant scents of country seclusion.

The upper stories of houses in Edinburgh and other cities are unquestionably, during the sleeping hours, the most unwholesome, if they be close shut, as they would be the very contrary if well ventilated while inhabited, the streets being then in the most healthful state; for all those filthy trades with which every large and densely populated town inevitably abounds, which all day long are open to the air of the streets, are at night shut in with their unsuspecting owners, who thus for many hours inhale foul contaminated air, which poisons the place, inducing fevers, as well as spreading infection to a whole neighbourhood. How ardently we desire to hail the time when mankind shall have arrived at a state of mental firmness and intellectual cultivation, that shall enable them to reflect and judge for themselves, instead of clinging in imbecile ignorance " to old saws and modern instances."

Who are more healthy than the night coachmen and guards, the latter of whom sleep almost the whole hours of darkness away in this dreaded nocturnal air? Where are there men less afflicted with disease than all suburban market-gardeners, who sleep soundly while they are travelling nightly with their produce? and, not to multiply instances, Is there on the wide earth a more hardy race of human beings than the gypsies? Who hears of colds, of fevers, of contagion, among those mysterious and interesting vagrants, who rest under the " melancholy boughs," with their slight canvass flapping in the gale; and in fogs and driving snow, sleep more securely, shielded from the effects of the " prejudicial night air," than does the daintiest lady in the land, " with all appliances to boot," in her well closed, and therefore unwholesome sleeping room? These obvious proofs of the fallacy of their long-cherished aphorism, " the air of night is prejudicial," are ever before the eyes of the million; yet do they continue to immure themselves and their families, for nearly half their lives, in a noxious and fetid air, which is thus almost deprived of that component (oxygen) which is so essential to sustain life. In passing through the lungs, the oxygen is absorbed, and more is required to render it fit for respiration; this the atmosphere will supply, and hence the absolute necessity of continual change.

We are well aware that, in the jungles of the tropics, exposure to the night air is certain death, particularly during the prevalence of rain. Moist heat is the bane of the European, when he is reckless, or ignorant of the requisite precautions to be adopted for his safety. The brisk exhalations that rise under a burning sun, during the day, are, in consequence of the short twilights of the tropics, suddenly arrested, and kept down within a very few feet of the surface of the earth; vegetation, rank, luxuriant, and in a state of decomposition, is then sending forth a pestiferous miasma, which induces disease, rapid and fatal, in proportion to its virulence. The natives may escape its effects for a longer time than a colonist; but even they are swept off in vast numbers, when once the malaria has fixed on one individual. Our incautious countrymen, obeying their instinct rather than their reasoning faculties, clothe themselves in their lightest garments, abjure the use of flannel (which is absolutely requisite to be worn next the skin), court the cool and treacherous evening breeze, and with it imbibe the poison of fever.

Our colonies are all stationed according to the dictates of our national opprobrium,—the love of gain,—rather than with any regard to the health and comfort of the victims who are sent to fill their hungry graves. The confluence of rivers,—the margin of the sea,—the neighbourhood of a forest,—the proximity of a jungle,—the low, flat, undrained, marshy plain, are too frequently chosen as sites of a settlement for our unfortunate countrymen: and although the mortality of such situations is well known (witness Sierra Leone), no effort is made to remove the inhabitants to a more healthy district; yet the very nearest gentle eminence to the noxious spot would ensure them from all danger of falling victims to the "jungle fever."

Our settlers in North America almost invariably adopt the same unwise plan; easy access to a river is almost essential to their comforts, while yet the country is devoid of roads; and thus, "with all that world before them, where to choose," they select the immediate proximity to the stream, which will inevitably overflow its banks, and, stagnating on the surface, while slowly evaporating, will leave agues and death to the incautious colonists. Ventilation, too, is, in such situations, nearly impracticable; with a forest in the rear, a river in front, and another impervious shade beyond, how is an accession of pure air to filter through a mass of vegetation, which is in every stage of growth and putrefaction, decomposition, and fermentation?

But to return to our own beautiful and healthful country, and its ill-instructed inhabitants on those particulars which mainly contribute to their comforts and well-being. Not only would we recommend undeviating attention to the ventilation of apartments throughout the year, but we would strenuously advise that the bed-clothes and wearing apparel should be subjected to the same purifying process every day. We were much impressed, during the perusal of a recent work on the habits and manners of the inhabitants of Persia, with some observations that were made on the subject of airing,—literally *airing* the bed and body linen which may be in daily use. Every morning the night-dresses and coverings to the couches are brought out by slaves into the enclosed yards, there thoroughly shaken, and left for hours in the air. We would not be supposed to compare the climate of Persia with that of England, or to infer that the usages of one country should be adopted in another, without regard to the obvious differences in the temperature of the two; but we would urge, that modifications of useful customs might be made with the best results. For example, the sweet and cleanly practice already mentioned ought to obtain in our own country, in summer, to the full extent that it is in Persia; and in the winter, a mode of airing should be substituted which would expose the linen less to the absorption of damp. Many tidy housewives have a great dislike to the sight of an unmade bed; and give orders that their servants or daughters should make the beds before they leave the rooms in the mornings. A more unclean habit, and one fraught with greater danger to the occupants, can scarcely be imagined. It is well known to physiologists, and scientific men in general, that the exudations (or perspiration) from the human body, are constantly given out through the pores of the skin, to the amount of perhaps two pounds weight in the course of every twenty-four hours, and these exudations constitute *insensible perspiration;* that perspiration which is seen and felt after violent exercise is quite another affair. If these exudations were to be impeded from escape in the form of evaporation, as in the well known instance of a Mackintosh or India-rubber covering, it would settle upon the inner surface of the caoutchouc in drops; and a portion of this moisture, which, having passed through the system and done its duty,—Nature discards,—would be absorbed into the constitution, and being chemically altered in its nature, would oppress and overcharge the animal economy, and produce disease. Again, when a person is out of health, his secretions, and consequently perspirable exudations, must be vitiated: these are absorbed by the sheets and blankets; and if the bed of the invalid, who is perhaps sickening with incipient fever, be remade as soon as he shall leave it in a morning, the windows probably remaining closed, and even the door shut, *to look neat*, all this impoisoned miasma is not idle,—it is fermenting in the bedclothes, sinking into the floors, clinging to the walls, ready to seize on the occupant, who is prepared by indisposition to imbibe, and unable to resist it by reason of his weakened powers: *he* becomes the immediate victim; and being now confined to his bed, with injudicious attendants to keep windows closed, and bed-clothes unchanged, the whole apartment becomes contaminated, and infection, from this trifling cause, spreads far and wide.

The plan of simple ventilation that we have adopted for many years, and the beneficial results of which we have had ample reason to approve, and therefore *strenuously to recommend*, is this;—to have the bed-clothes turned down off the beds, on to the backs of a couple of chairs, and the windows and doors set open as wide as possible, unless rain be beating in, or a heavy fog prevail at the time: they are thus to be left; the night-linen to be spread open, or hung up on a peg; in a couple of hours the beds may be made, and the rooms finished. Should the linen have contracted any perceptible dampness, the night-dresses can be placed near the fire, and a pan of coals put into the beds, which will thus be sweet and wholesome for the reception of their occupants at night.

All this care and attention may be considered troublesome to those who are not in the habit of attending to household arrangements; but every one is aware that a regulation once made and adhered to for a few days, becomes as easy of performance as any other portion of our own or our servants' daily routine of employments. Again (for we are supposing that we may have encountered a caviller against this useful advice among our readers), we would ask, what degree of trouble would not be amply compensated by ensuring the enjoyment of a vigorous state of health; and what is so likely to ensure that blessing as freely to admit pure atmospheric air continually to our apartments and our persons? Dr Franklin's *air-bath* will recur to every reader. Our recipe for health is so simple, that it is within the reach of, and ought to be adopted by, every member of the community. Persons are little aware how much their wellbeing is in their own power, and how easily diseases may not only be kept at bay, but absolutely vanquished and annihilated; and this, too, by the most obvious, rational, simple acts imaginable. Out-of-door drainage, internal cleanliness, sobriety, temperance, dryness, frequent ablutions, free ventilation, and common prudence, will (barring inherited disorders, and those already contracted by our own recklessness) guarantee a mirthful childhood, cheerful and athletic prime, and an old age free from pain.

We have mentioned dryness as one of the essentials in promoting health, and are quite confident of the truth of our assertion. Moisture is inimical to man, and, when accompanied by heat, highly injurious. If evaporation from an extensive surface of undrained land be the cause of malaria, &c., it is proportionably baneful on a small scale; the very mopping of a floor, if that floor be not quickly and thoroughly dried, may be the cause of malady. One of the noblest and most eminent surgeons of the metropolis, the late John Taunton, used to say, that many an illness had been caused, and frequently death ensued, from sleeping in a bed-room that had been scoured, and had not been thoroughly dried before its occupant retired to rest. We are so entirely convinced of this, that during the winter months we do not allow any sleeping apartment to be ever washed, unless the rare chance that a brisk north wind prevails, and proofs exist that the atmosphere is in a drying state. We are contented with the cleanliness to be obtained by thorough and frequent sweeping.

We have always thought that the damp discomfort of our shipping is the cause of much of the unhealthiness of their crews. In addition to continual liability to extraneous wettings, the sailors are daily employed to scrub and scour and slush the various parts of a vessel, thus adding to the noxious evaporations of the bilge water, instead of counteracting by every possible degree of care the superabundant moisture to which, independently of either rain and ocean, they are necessarily obliged to submit.

We were therefore delighted a few days since, while perusing Combe's "Constitution of Man," to meet with a letter from Captain Murray, R. N., in which he detailed a system, with its results, diametrically opposite to the old pernicious slushing method, by which so much discomfort and illness have been ensured to that numerous and interesting portion of our fellow countrymen, who peril their lives on the high seas. We will give a few extracts from this admirable document, which bear upon our subject; and most sincerely wish that the entire letter were published separately, and that a copy of it could be placed in the hands of every captain and owner of vessels, from the stately line-of-battle ship, with its stifling lower decks, to the merry pleasure-boat that plays about "in shore."

* * * "I attribute the great good health enjoyed by the crew of his Majesty's ship Valorous, when on the West India station, during the period I had the honour of commanding her, to the following causes; 1*st*, to the keeping the ship *perfectly dry* and *clean*; 2*d*, to habituating the men to the wearing of flannel *next* the *skin*;" * * * * "The quarter and main decks were scrubbed with sand and water and wet holystones every morning at day-light. The *lower deck, cock-pit*, and *store-rooms*, were scrubbed every day after breakfast, with *dry holystones* and *hot sand*, until quite *white*,—the sand being carefully swept up, and thrown overboard. The *pump-well was also swabbed out dry, and then scrubbed with holystones and hot sand; and here, as well as every part of the ship which was liable to damp, Brodie stoves were constantly used, until every appearance of humidity vanished*. The lower-deck and cock-pit were *washed once every week in dry weather; but Brodie stoves were constantly kept burning in them until they were quite dry again.*

"The hammocks were piped up and in the nettings from 7 A. M. until dusk, when the men of each watch took down their hammocks alternately; by which means, only one-half of the hammocks being down at a time, the 'tween decks were not so crowded, and the watch relieved was sure of turning into a dry bed on going below. The bedding was aired once a-week at least. * * *

"I was employed on the coast of Caraccas, &c. * * all the West India islands from Tobago to Cuba, both inclusive, as also Curaçoa and Aruba,

* * * Vera Cruz and Tampico in the Gulf of Mexico, which, you will admit, must have given a trial to the constitutions of my men, after two years among the icebergs of Labrador, without an intervening summer between that icy coast and the coast of Carraccas; yet I arrived in England, June 24, without having buried a single man or officer belonging to the ship, (the crew of which consisted of 150 men and officers), or indeed having a single man on the sick list; from which, I am satisfied that a *dry* ship will always be a healthy one *in any climate*. When in command of the Recruit, of 18 guns, in the year 1809, I was sent to Vera Cruz, where I found the ——— 46 guns, the ——— 42, the ——— 18, and ——— gun-brig; we were joined by the ——— 36, and the ——— 18. During the period we remained at anchor (from eight to ten weeks), the three frigates *lost from thirty to fifty men* each, the brigs *sixteen to eighteen*, and the ——— *most of her crew, with two different commanders*; yet the Recruit, although moored in the middle of the squadron, and constant intercourse held with the other ships, *did not lose a man, and had none sick.*" * * * *

This letter is so valuable and interesting, that we can with difficulty abstain from copying the whole of it; sufficient, however, has been laid before our readers, to add the weight of authority to our urgent advice, on a matter of vital importance to every member of the community.

It is well known that woollen goods absorb and retain the effluvia of infection more readily, and for a longer period, than those of linen or cotton; hence it becomes an imperative necessity—in the event of a contagious illness—to expose all clothes of this material, and particularly blankets, to the action of a great degree of heat, and then to free ventilation. We have a theory that all contagion is vitality, *i. e.* actually living insects, perhaps more minute than our most powerful magnifying lenses can, or ever will, discover. Exposure of infected clothes to a heat of 150° (which was recommended during the awful visitation of the cholera), seems to prove this, and that at this high temperature the vitality of the insect would be destroyed. In almost every family may be found simple facilities for this necessary exposure to heat. When the weekly baking is over, and the bread withdrawn, let a thermometer be placed in the oven, in order that the degree of temperature may be ascertained; and if it do not reach 150°, let a little more fuel be ignited, and then well cleared out. To those who do not possess a thermometer, a piece of white paper will afford a sufficiently accurate test;

it must shew no scorch. Now have the blankets (one at a time) unfolded, and placed in the oven as lightly as possible, the door remaining open. The moisture, which will soon exude, and stand in drops at the mouth of the oven, will astonish those who are unacquainted with the physiological fact before adverted to, of the prodigious quantity of fluid that is constantly escaping from our pores by means of insensible perspiration. The blankets, too, having been taken from off an occupied bed, and consequently considered to be well aired, will excite surprise, as shewing so much damp. After they have been in the oven for an hour, they should be well shaken, and hung out in the sun and wind for several hours. Blankets which are not washed during the summer, should be exposed to the drying and sweetening influence of the air, before they are put away for winter use; and a large chest will always be preferable to their being folded up and placed under the beds.

Clothes which may have been sent to a tailor's, ought always to be subjected to the process of great heat, and thorough ventilation. We have adopted this practice (and attend to it invariably), ever since we saw an account in the papers, some years since, of the death by smallpox of a young man, recently married to a sister of the celebrated Miss O'Neill. · A coat had been sent to be altered by a tailor, in whose family that insidious disorder was afterwards ascertained to be raging.

By using our reflective faculties, and by a little care and precaution, much of suffering may be averted from our families; and surely health is too valuable not to be retained at even the expense of *considerable pains.* We bestow infinite care and attention upon the enjoyments of our tables, and shall we not guard the blessing, upon which depends our capability to relish not only these delights (that are among the very lowest of the pleasures with which our existence is cheered), but all the superior gratifications of intellect?

Although it must be evident to all reflective minds, that nothing has been bestowed upon us in vain, and that our senses were given that they may administer to our permanent good, as well as to gratify us with temporary enjoyments, it is surprising that so little value is attached to the sense of smell. We make use of our gustative sense to warn us from eating that which would prove inimical to health,—our sense of touch, to guard us from external injury,—our hearing, to avoid low and improper language,—our sight, to prevent mental and bodily annoyances; but who evinces any value for the sense of smell beyond the evanescent delight which it furnishes in enabling us to inhale the fragrance of scents? We think that, of all our sensations, it is the most powerful and best to be trusted, in shielding us from infection. A keen sense of smelling, in the principals of an establishment, is of incalculable advantage. No danger need then be apprehended from foul scents; and neglectful servants will be unable to leave extraneous matters to ferment into a dangerous mass of miasma. We have always remarked, that an obtuseness in the sense of smelling is very general among the poorer classes; this is to be regretted, inasmuch as, from their too frequent inattention to cleanliness, they possess the tremendous power of engendering, fostering, and disseminating contagious disorders.

THE AGRICULTURIST'S NOTE-BOOK.—NO. IV.

Smallpox.—This woful and pestiferous disorder has not been so prevalent throughout England, as it now is, for a period of forty years. This is an appalling and disgraceful fact; appalling from the nature of the subtlety and loathsomeness of the disease; disgraceful to the character of the English nation, both government and people.

In our opinion, nothing can excuse the guilty supineness of our rulers on a subject of such importance to the welfare of the community, as is the eradication of the smallpox from among us. It is galling to one who would fain feel proud of his country's administration, that he should be compelled to acknowledge—" they manage these things better in France." There " the strong hand of power" exerts itself to avert the wide spreading devastation, thereby seconding the evident intentions of the Almighty beneficence. He first sent the scourge; He then put it into the heart of man to mitigate its horrors by means of inoculation; He after signified His pleasure that it should cease from troubling the nations, and allowed our favoured country to produce the honoured and happy discoverer of a safe—a *certain* remedy for the evil—in the supreme blessing of the vaccine. We could almost believe, that inasmuch as " the Lord thy God, is a jealous God," &c. — He has seen the ingratitude of this—" His chosen people,"—and resenting our detestable insensibility to his goodness, has again suffered the mighty scourge to descend upon the nation, " visiting the sins of the (ungrateful) fathers upon the (innocent) children."

While one obstinate member of the community remains unconvinced of the blessing and the safety of vaccine, and the boasted liberty of the subject enables him to adhere to his stupid prejudices, so long the whole nation is liable to be visited by this heavy infliction through this one individual. But the liberty of the subject is a nonentity, a chimera, an injustice, if it be not equally enjoyed. In this instance, it would be limited to this single subject; he would choose to inoculate his child for the smallpox, and he would do it; the remainder of the community might object to the risk to which he would expose them, yet *he* would conquer, and *they* might suffer. Inoculation for the smallpox is so entirely needless, that all who risk the lives of their fellow-subjects by resorting to it as a remedy, ought to be as strictly amenable to the laws as any other malefactor. The man who originates the smallpox in a district, however well inclined he may be to confine the infection to his own residence, is utterly unable to accomplish his wish; he has introduced a terrible scourge—given liberty to a tyrant, placed his neighbours, nay the whole susceptible portion of the nation, in the power of a pestilence that may destroy thousands. Talk of the wickedness of an incendiary—a rick burner;—what is the headstrong, stupid spite, of one who destroys a few outbuildings with their stacks of corn, compared with the selfish wickedness of that man who, to satisfy a *needless* anxiety for safety from smallpox, introduces it among his neighbours, and probably causes the death of multitudes of his fellow-creatures? One instance of this wholesale selfishness we know to have occurred, where a district had been free for many years from all fear even of the scourge, when one individual fancied he had better secure himself from risk of taking the smallpox and was inoculated; *he* did well, but ten of his immediate neighbours died of the disorder which he had thus wantonly introduced among them.

Inoculation—once a blessing—is, by the force of circumstances, and the changes in progress of events—now become a curse. For nearly a century after Lady Mary Wortley Montague immortalized herself by her bold and noble advocacy, adoption, and introduction of it into Turkey,—the *then blessing* was looked upon with the jealous eyes of ignorance as a snare,—and by the superstitious, as a "tempting of Providence,"—so that its benefits were very imperfectly and partially felt; few (comparatively) dared to receive and adopt the boon. Vaccine was discovered, and being an innovation, was scouted and discountenanced; and then inoculation gained ground, as if saucy, puny man, had set his tiny might against his beneficent Creator, and had resolved to strive for the mastery, in order to retain a frightful evil in the land, which could be with facility eradicated! Among the educated and reflecting portions of the community, this chief of God's gifts—vaccine—was received with gratitude and avidity; and millions have lived and died unscathed by that great scourge of humanity—the smallpox. There are, however, numerous partizans of inoculation, chiefly among the ignorant poor, who will not be convinced of the efficacy of vaccination, who are obstinate and credulous, and unfortunately have the ability to counteract all beneficial institutions, all authority, all schemes for abolishing this tremendous disorder, for *they inoculate one another*,—and thus baffle the exertions of local medical residents, and keep the evil ever afloat!

It is a duty incumbent on all influential persons to endeavour, by every means in their power, to abate this evil. We have all dependents who may be reasoned with; they will tell us that "they do not like vaccine,—that it is not a certain preventive of the smallpox, that many who have been vaccinated have afterwards taken the other; that vaccination will only, at best, insure a person from infection for seven years; that every body *must* have the smallpox, so they can but do as others do," &c. To this we would reply—that we are not much surprised to hear unreasoning, unreflecting persons, object to so simple, so innocuous a disease, as a substitute for one of such palpable and mighty effects. They cannot comprehend it; they would place greater faith in a substitute that should more nearly resemble the terrible original; a sharp fever, and an unsightly eruption, would have something to shew for their boasted power over the rival disease; but one little spot on the arm,—scarcely one day's uneasiness,—no pain,—no nursing,—no alarm!—no, no! they do not, they cannot like it! To the objection that " it is not a certain preventive of the smallpox," we reply, that it has recently been ascertained by Dr Sonderland of Bremen, to be merely a modification of the smallpox, and calculated to prevent a recurrence of that disorder, which (among others) *can* only occur to the individual *once* in his life; and that from the exceedingly simple nature of this inestimable substitute,—it is frequently neglected, its course not watched by a medical practitioner, and not understood by the public. If we belonged to a " society for the diffusion of useful knowledge," one of our first efforts would be to circulate either gratis, or at the cheapest possible rate, pamphlets on the blessings of vaccination, with *coloured prints* of the pustule in every stage and daily gradations, from the first to the fifteenth day. Such a plate we possessed for many years, affixed to Dr Aikin's admirable little work on this disease. This plate having been familiar to the eye, was (though unknown to ourselves), as much " learnt by heart," as the literary portion of a book could be when committed to memory; for—especially in early years—the recollection of that which has been constantly in sight, is as indelible as learning by rote. We have lost this faithful representation of the cowpox pustule in all its phases for some time, but the impression is as vivid in the " mind's eye," as if we had seen it but yesterday. So that from memory we should be able to watch the progress of vaccination, and detect if the operation had been safely performed, and the patient *secure* from future contagion.

When a person is stated to have " had the smallpox twice," to have " caught the smallpox after having been vaccinated,"

&c. we are morally certain that the fallibility of man has been in fault, not the unerring decrees of the Creator, in other words, the operation had been imperfectly performed. The weak-minded and the prejudiced,—and are they not synonymous?—invariably lean to solutions of their difficulties which tend to impugn and controvert immutable laws. Whereas, such is now the rapid spread of real knowledge, that the wisdom of the Almighty's " contrivance," and his unalterable system of cause and effect, are being made apparent to the capacity of the million.

We will now continue to answer those futile objections which the ignorant raise against the adoption of vaccine. According to their shortsighted view of the subject,—if vaccination be not a certain preventive of the great malady, neither is inoculation, for numerous cases are cited *as actually known to exist, of the disorder having been taken a second time!* Again, it is not correct that the virtue of the cowpox loses power in the course of seven or ten years; and if it did, there are cows in abundance in the country whence we may always obtain a fresh supply. Besides, granting the assertion to be correct, what so easy as to repeat the operation of vaccinating ourselves and our children every sixth year during the term of our lives? We introduce no illness by using this precaution; we incur no inconvenience; and if we did, it would be a trifling penalty to ensure safety from one of the most loathsome diseases to which humanity is liable.

We have felt it a duty to place this matter before our farming friends, in the hope that they will give the subject their serious consideration, and not only adopt the simple and blessed succedaneum in their own families, but advise their dependents, and use every allowable method to stem the evil. However limited our means of achieving this great national good, we may effect something; and if every private individual would and could command only a trifling sway, the scourge would be obliterated from the nations. All our readers may not have seen the account from Paris, to which we adverted at the commencement of this paper; we therefore subjoin it, if it were only to prove that it is sometimes a blessing to a people to possess a government *able*, as well as willing, to legislate peremptorily, not to say *arbitrarily*, for their benefit, when, from the ignorance or indifference of the community, they are unequal to act for themselves.

Vaccination.—"*Paris, Nov.* 29. 1837.—In consequence of the number of deaths that take place annually, not only in the capital, but in the departments, through the negligence or the antipathy of the lower classes to have their infants vaccinated, government is about to issue an order or decree, obliging all accoucheurs or midwives to send in a return of the number of children they may have brought into the world monthly, which must be sent under cover to the Prefect of Police, who will give instructions to the medical men of the respective districts to vaccinate the child or children, at the expense of the state."

"The Ecole de Medecin, and the Faculty of Medicine of Paris, have voted a sum of 85,000 francs, to defray the expenses of the profession in attending on the poor; and gold and silver medals will be awarded annually to those medical men who may have vaccinated the most children in that period. Government will also give the greatest encouragement for the propagation of this most humane preventive of the disfigurement of the human race. By an official return, it appears, that, during the last year, the small-pox raged with such violence, that upwards of 25,000 children either fell victims to that dreadful malady, or became so disfigured, and lost their eyesight, as to be objects of compassion the remainder of their lives.

"In the Hospitals of Les Enfans Trouvès, or foundlings, and in towns, very few cases occurred, as every attention was paid by the profession; but in the villages, generally inhabited by an ignorant and prejudiced race of people, the loss of life was very great. Great praise is due to the English medical men residing in this capital, Boulogne, Calais, and other parts of France, for the progress they have made in propagating vaccination throughout these departments, where, until of late years, it was entirely unknown; and many have been rewarded by Government with the Cross of Honour, for their disinterested and philanthropic exertions."

Barm, or Yeast.—Believing—as we do—that home-made bread is a luxury which all classes would do well to enjoy, and thereby avoid the injurious effects which adulterated bread invariably produces;—we would facilitate, by every means in our power, the attainment of so desirable a comfort; especially by a class of persons, who, possessing few other simple luxuries, require that those within their power should be easy of attainment. Making bread at home is an operation very easy of acquirement; and, doubtless, most of our farming friends are fortunate in possessing worthy helpmates, or experienced servants, who provide the families with this daily necessary. To such, a practical method of performing the art would be deemed needless; but others of our readers, who may not have considered the expediency of this bread, its superior salubrity, its *decided economy*, and the feasibility of its preparation, may be pleased to meet with the details of a plan by which a family has, for the last seven years, been celebrated for the superiority of their bread. In our next Number, therefore, it is our intention to enable every one to ensure that staple of our food, light, and *undeviatingly* good. At present, we would only say a few words on the subject of an essential ingredient in bread-making—yeast.

We decidedly give the preference to ale-yeast from a brewer, to that which is obtained from porter or stout; neither the colour nor flavour of the latter is so good. A prejudice exists against yeast which results from home-brewed beer, but it is only prejudice; for, if it were only on account of the superior salubrity of that beverage—from the absence of adulteration—the yeast must be better; but the fact is, the bitter principle abounds in a far greater degree in beer which is made in small quantities, and is intended for keeping. This bitterness being difficult to be overcome by the generality of persons, a useful article is frequently thrown away, which might supply two or three families for three or four weeks with this essential ingredient in bread-making. We have ourselves baked bread that was made with the barm from our own home-brewed beer for six successive weeks—not from necessity, but in order to ascertain the extent of time to which yeast might be kept sweet. Every scheme that we could hear of, or devise, for the preservation of this substance, we have fairly tried, and have found that the simple plan of daily washing it with fresh spring-water is by far the most effectual. No other method will subdue that offensive bitter, which, however tolerable in beer, is in bread utterly disgusting. This plan respects yeast which is to be kept for some time; but for that which is brought fresh from a brewery for immediate use, bran is the only countervailing substance that can be used with effect. "Hot cinders," "live coals," "burnt crust," &c. are worse than useless. Bran contains an acid principle, which tends to subdue the bitter taste of the hop: it also possesses much fermentative matter, that assists the action of the yeast. In making bread, the warm water, salt, yeast, and about a pint of good fresh bran, should all be put into a pitcher or pan, and stirred well together, and then poured through a sieve into the middle of the flour.

The method of keeping yeast by washing, is thus managed. As this substance works out of the barrels, it should be placed in deep pans, and left to settle for a day or two. The thin fluid should be then poured off, and the pan filled with cold fresh spring-water, stirring the thick yeast well up. Every day this operation is to be repeated, and occasionally it ought to be strained through a sieve into another vessel. It will thus always be ready for use.

A batch of bread will sometimes be spoiled when every precaution shall have been taken, for want of experience in the scent and appearance of yeast that has been procured at a brewery. This experience cannot be taught, it must be acquired; and we can only do our best to point out the means of learning how to discriminate that which is fresh and available, from that which is foul, and certain to cause disappointment if it be used.

Barm keeps better in a large than a small quantity: hence the portion that is required for one baking (and no more) ought to be obtained, and used either on the same or the next day. If it be fit for the purpose, it will smell rather fragrant; if stale, it will have a strong, acid, and slightly putrid scent. In this state, we have known it to be recovered, and rendered available, by adding a tea-spoonful of flour, the same of sugar, a salt-spoonful of salt, and a tea-cupful of warm water, and setting it near the fire to rise, having well stirred it. This should be done about an hour before it is intended to be mixed with the flour, for that time is required, in order to watch whether the fermentative principle is strong enough to work the bread. In a quarter of an hour the mass will have nearly reached its height, and a fine head will have formed. This must be looked at carefully; if it continue up, and appear opaque, it may be trusted; but if it "go back," *i.e.* sink, look hollow, and watery, and the bubbles break, it will infallibly spoil the batch; it must be thrown away. *Bran ought always to be used*, however fresh and good the ferment may be found.

We have hitherto been taking for granted that our readers reside within a convenient distance of a public brewery, or of a family brewing; but there are many districts where home-made bread can scarcely ever be tasted, because of the difficulty of obtaining yeast, and the exorbitant price at which it is charged. Many succedanea have been proposed, but nothing that we have seen has answered the purpose so well as the product of beer. We have been assured by a baker, that he never procures his yeast from a brewer, but makes his own fresh every day. He gave us his receipt, and we made trial of it, but to no good effect: it was, in fact, merely small brewings, without hops. In looking lately through the pages of last year's volume of a little useful work styled "The Magazine of Domestic Economy," we saw a letter to the editor from Sir William Elford on the subject of making yeast, which appears to merit attention. It is evidently the same plan as that which our baker mentioned to us. We will copy it, not as the result of our own experience, but in order that such of our readers who may wish to make trial of a substitute for brewer's yeast, may possess an approved method. We shall abridge Sir William's letter, dated from the Priory, Totness, 20th March 1837, retaining only the detail of his plan. He begins by stating, that it was evident to him, that hops were a necessary ingredient in beer, but decidedly were perfectly useless in bread; and adds, "it therefore followed, that if an active yeast could be elicited by a mixture of malt and water only, the great desideratum would be attained. * * *

"I found, on inquiry, that the essential part of the malt would be obtained by mixing with it three times the quantity of water; and I began on a small scale, in order that the whole process might pass in my private room, under my own personal inspection. A gallon of malt, ground, was put into a wooden vessel; and three gallons of water, short of boiling, were poured on it; the mixture was frequently stirred, and a cloth kept over it. At the end of two hours the liquor was strained from the malt, and boiled for three hours, again returned to the vessel, and, when cold, something less than half a pint of the best yeast that could be procured stirred into, and thoroughly incorporated with it. The vessel was then placed in a moderately warm situation, with a cloth spread over it. Fermentation soon took place, and, in a few days, the frothy substance which appeared on the top subsided, and the liquor having been poured off, a quantity of fine yeast was found at the bottom. In some cases, when the foam or head did not subside as quickly as at others, it was skimmed off, and mixed with what was found beneath. Both modes produced what was equally good. The yeast was then to be put into bottles; but, being very thick and tenacious, could not be got into them without mixing with it a small portion of the liquor: within twenty-four hours, the two substances separated, when the liquor being at the top, was poured off, and cold water poured on the yeast in its stead, leaving some little space between the top of the water and the bottom of a cork, which should be put into each bottle about twenty-four hours after bottling. When a part of the yeast is taken from a bottle, water must be again put on the remainder before it is recorked. The bottles must be placed on their bottoms, in a wide vessel half full of water, and kept in a cool situation.

" It has been stated above, that the first made extract from the malt was put into fermentation by some of the best yeast that could be procured. Now, your attention is most particularly called to what follows. Care was taken to keep yeast enough from the first batch to set the second in fermentation, and thus each has in succession been ignited (if I may use that expression), demonstrating, beyond all contradiction, that this substance, when once established, generates within itself the elements of its own perpetuation, which constitutes a very important part of its value.

" With the yeast so minutely described, my table in the eating-room, at breakfast, and dinner, has been supplied for more than three months, during which period there has not occurred in any one instance, the slightest failure, and, it is unnecessary to add, without the occurrence of any bitter taste. The bread for the common household purposes has been purchased at Totness from the baker's, as it had long been, before my experiments commenced.

" The dissemination of this discovery will not perhaps operate much in towns at first; but its great advantages will be most immediately perceptible among those who live apart in isolated residences, which comprises not only the richest and highest portion of the community, but also a very large and widely extended class of persons, the yeomanry of this great country, who, very unlike those, who thirty or forty years ago were known by that denomination, are now found with minds more cultivated, and capacities more enlarged, and whose sagacity will not only teach them the immediate value of this discovery in their families, but, more remotely, its operation on the object of their daily pursuit, by superinducing a large addition to the consumption of agricultural produce," &c.

Effects of successive Crops of Potatoes—Curl. By Mr James Falconer, Balnakettle, Kincardineshire.—The late, and, in many instances, extensive failures in the potato crop, have given rise to much discussion, as well as many conflicting opinions on this mysterious subject. The writer of the first article in No. 40 of this Journal, is of opinion that the recent failures in the potato are attributable to the deterioration of the soil in consequence of overcropping, or, in other words, growing potatoes for a series of years successively on the same ground. That they degenerate in quality, as well as decrease in quantity, in consequence of such management, I have no doubt. I shall state an instance which lately came under my own immediate observation in corroboration of the fact. In the spring of 1829, I broke up from old lea a piece of ground, measuring about three-fourths of an imperial acre, and prepared it for growing potatoes as follows. Having lain at least a dozen of years in grass, I set a plough to pare off the surface to the depth of three inches or thereby. Another plough followed in the same tract, going to the depth of at least other eight inches, which completely buried the sward. After going over it in this manner, it was drilled about two feet eight inches wide, dunged at the rate of twenty cart-loads or so of unfermented dung per acre, and immediately planted with newly cut sets of what are termed dons or pink-eyed potatoes. It produced a fair crop of fine-flavoured mealy potatoes. The ground, on the removal of the crop, was ploughed up with a good strong furrow, so as to expose as much of the original sward as possible to the influence of the winter frost. In the following spring, 1830, it was again drilled, dunged, and planted as above. This year's crop was uncommonly good, both as to quantity and quality. In the ensuing season, 1831, it was replanted, and produced an equally good crop, and also during that of the following season, 1832. Though contrary to approved management, owing to its contiguity to the farm-steading, it was likewise planted with potatoes during the three succeeding years, 1833–4–5, always receiving about the same proportion of unfermented dung, but in none of these years was the crop nearly equal to that of the four preceding, and in the last one it was very deficient, and the quality bad. Finding it now high time to vary the rotation, it was sown in 1836 with tares, without any additional manure; but though they turned out a middling crop, it was deficient to what I had expected. Last season, 1837, it was again drilled, dunged, and planted with potatoes, as above mentioned, but the produce was very deficient, and the quality by no means good; a convincing proof that the potato, like other crops, will not continue to thrive for a succession of years on the same ground. I have now limed this piece of ground, and sown grass seeds along with the crop, and intend to pasture it at least three or four years before I make another trial of potatoes.

It is perhaps necessary to remark, that it is a dry light soil, incumbent on a gravelly bottom, and was in high order when broken up, owing to its having formerly been used as a convenient site for the young stock occasionally eating turnip. As a good deal of the potatoes raised on this piece of ground were annually consumed in course of the harvest, and the remainder mixed among those grown in the field, I had no means of ascertaining the quantity annually replanted upon it, though from this circumstance I presume it must have been small.

The reasons assigned as the cause of the failures that have of late years occurred in the potato fields, are nearly as numerous as the failures themselves; and, after all, the real cause of the complaint seems as much a mystery as ever. Last year, there were few or no complaints, at least in this neighbourhood, of failures among the potatoes; but the year before, many suffered severely by the taint, or rot, as it is called. For my own part, until this year that rot has partially appeared, I have had very little cause to complain of any kind of disease amongst my potatoes, although they were very seldom changed. This year I got a change of seed from two of my neighbours, and that from one of them has partly misgiven. The various operations of drilling, dunging, cutting, and planting, were all performed alike and in the course of little more than two days, when the weather was very favourable, and the land well prepared. Mostly all that have failed belong to the variety termed dons, which were evidently, in some measure, injured by frost, as several were thrown aside quite soft by those who were employed cutting the sets. I had the curiosity to examine a great number of the sets which misgave, of which many had never sprung at all, and were in a soft putrid state. I also found a good many others with one small stem from two to three inches long, with a small brown tuber upon the point of it, about the size of a pea. Many even of those sets that have vegetated and come up, have small puny stems, quite the reverse, in short, of a healthy looking plant. In 1836, a neighbour of mine planted several acres of a field of good sound dry land, which had not before grown potatoes for several years. The sets, which were cut from ten days to a fortnight, made a very partial braird. In some places there were comparatively few blanks, while in others at least nine sets out of ten appeared to have failed. A few drills were planted for one of the labourers, who got the seed from me, and in these there were no blanks, from which I am induced to think that the rest of the seed had either been heated or frosted in the pit, or heated by throwing too many together after being cut into sets, as the dunging and planting, &c. were all similar. My potatoes were kept through the winter and spring in a well-aired outhouse, where they remained a considerable time with hardly any covering,—a place which I greatly prefer to pitting, and immediately covering up a great quantity of them together, when in a raw or wettish state, which is often unavoidably the case. It is not to be supposed, however, that those who grow several hundreds of bolls, can find conveniency within doors to hold the whole produce; but there are few farmers but what have houseroom for part, and where pitting must of necessity be adopted, the pits should be made rather narrow than otherwise, so as to avoid as far as possible the risk of their contents heating. Agriculturists seem a good deal divided in opinion as to the time the potato sets should be cut previous to being planted. For my own part, and I speak from a pretty lengthened experience, I have uniformly found newly cut sets come quickest up, and continue the most regular and thriving plants during the season. Although I approve of fermented dung for raising potatoes, as well as turnips, I have often applied it otherwise, and found it succeed very well if not too dry and rank. It is also greatly in favour of the crop, that the various operations of ploughing, harrowing, drilling, dunging, planting, and covering in, are as speedily performed as possible, so as the plants may have a sufficient supply of nourishment at the outset.

The disease termed the curl, which is often very destructive to the potato crops in the low fertile lands of Scotland, has seldom appeared in this part of the country, and never to any great extent. Like the taint, it has formed the subject of much ingenious speculation, and as yet the cause of it does not seem properly understood. Some writers on the subject assert that it proceeds from insects preying on the sets and young stems,—others from excessive seed-bearing,—too deep or too ebb planting,—a late, cold, and frosty spring,—too early planting,—too small cuttings,—time, or old age, &c. Mostly all, however, seem to agree that a change of seed from a high climate operates as preventive for some years at least. While conversing lately with a person in allusion to this complaint, which appears to have been unknown prior to the year 1778, he assured me that he had been at much trouble to ascertain the cause of it, and had invariably found that the sets from which it was produced were those cut *across* the *stem end* of the potato, which is contrary to the usual practice, and ought never to be done. It may be so for ought I know, but another and apparently very plausible reason is assigned for it by the writer of an article on this subject in the 38th Number of this Journal, who speaks of it as follows:—"No disease appears to me so evidently to arise from impaired vital energy in the plant, as the curl that of late years has made such extensive ravages upon our potato crops. Any one can assure the occurrence of this disease, at least I have found it so in the county of Essex, by keeping the sets in a situation favourable to their vegetation, as in a warm damp outhouse, and rubbing off repeatedly the long shoots they have thrown out. Sets that have been so treated, I have invariably found produce curled plants." The impression on my own mind, in regard to these complaints, has all along been, that they are local and not hereditary. I may be wrong, but such at least is my opinion. I might have stated an instance of failure in a new variety of potato which lately came under my notice. Some four or five years ago, an acquaintance of mine brought over from Dublin a few potatoes, lately imported by a gentleman from America. They were called, as far as I can recollect, the South American pink-eyed, and cost my friend a shilling each. They were cut in the most economical manner, and produced a full crop. The year following they produced a remarkably heavy crop, but last year they partly failed, and this season they have almost entirely misgiven.

Best and safest Wash against Smut.—M. de Dombasle, after many experiments, has found the following preparation to be the *best* and *safest* wash against smut in wheat; viz. "17 lb. 10 oz. and 6 drams, Avoirdupois weight, of sulphate of soda, or Glauber salts, dissolved in 22 imperial gallons of pure water. As this salt does not dissolve very readily, it should be prepared the evening before use, and stirred frequently. The grain is to be formed in heaps on a floor, which are to be completely moistened with the above wash by means of a watering-pan with a rose head. During the time the wash is being poured over the heaps of grain, they must be kept constantly stirred about by means of wooden shovels, till the whole be perfectly moist, which is known by the wash running from the heaps after they are sufficiently saturated. After the grain is well moistened, lime in powder is to be immediately thrown over the heaps, in the proportion of about 4 lb. 6 oz. 9½ drams, Avoirdupois, to the 22 gallons, imperial, of grain; this is done gradually, while the grain is to be turned over in every direction, so that the whole may be intimately combined. When this is done, it may either be sown immediately, or kept for some days, in which case it may be turned over every three or four days. The quantity of lime mentioned does not require to be measured with great exactness each time it is used; it is sufficient to weigh the first time the quantity of lime which a suitable vessel may contain to serve as a future guide. With regard to the lime, it is to be taken in the pieces as burnt, and slaked by a small quantity of water, and should be used as soon after it is reduced to powder as possible; but if one is obliged to keep it for some time, it should be placed in a cask, open at top, and covered with a cloth, over which should be an inch of dry sand or ashes: each time any of the lime is taken out the above cover should be replaced."—*Journal des Connaissances Usuelles et Pratiques* for 1835, vol. ii. p. 148-155.

M. de Dombasle made a *vast number* of experiments before he hit upon the sulphate of soda. In his trials he used various proportions of the sulphate of soda, some four times stronger than the quantity that was found efficacious, and yet without injury to the germinating property of the grain. The *lowest* proportion to be efficacious is that given in the above extract. Although the opinion and authority of M. de Dombasle ought to have great weight with agriculturists, yet a more effectual mode of moistening the grain with the wash is practised by some farmers, than by throwing the grain on the floor in heaps. It is this: Let one tub be placed containing the wash; let some of the grain be poured into a wicker basket, of such a size as, when nearly full of grain, it may be easily lifted by a person, by the two handles placed upright on the rim; let the basket be then dipped into the wash, till the grain is all completely moistened, then set it on sticks placed across another tub, to drip away the superfluous wash. Meantime fill another basket with grain, and while it is being moistened in the wash, empty the grain in the former basket on the floor in a heap, which dust over with quick-lime. In this manner continue to moisten all the grain required, and after the whole of it has been put into heap, and dusted with lime, let it be thoroughly turned over and over again, until the lime dries every particle of the moistened grain. The baskets can either be made on the farm, or procured at small cost; and a couple of them will last many years. Tubs are used for many other purposes on a farm.

Grease for Wheels and Machinery.—M. d'Arcet, the celebrated French chemist, and Master of the Mint in France, recommends the following composition as the *best grease for* *wheels and machinery*, viz.—" Eighty parts of grease and twenty parts of plumbago (black lead), reduced to *very fine powder*, and *most intimately and completely mixed together*. M. d'Arcet employs this composition with the greatest advantage at the Mint, for locks, for his fowling-piece, &c. In a journey from Paris to Marseilles, he greased with the above the wheels of his carriage, and again at Marseilles before his return, and the wheels, which appeared heavy and clumsy, rolled with the greatest ease, to the astonishment of the drivers. A very small quantity suffices. He gave some of it to a person going from Paris to Rome, who, on his return, gave him back the most of it, so little was required."—*Journal des Connaisances Usuelles et Pratiques* for 1830, vol. ii. p. 237. G. J.

Liniment for the galled backs of Horses.—" For the information of other travellers, we may mention, that, after having tried many applications to the backs of horses, when galled, we have found none that succeeded so well as white-lead moistened with milk. When milk was not to be procured oil was substituted. Whenever the application was made in the early stage of the wound, we have found it to be very effectual, and it is likewise a convenient one, as two ounces of white-lead sufficed for the whole of our party for more than a month."—*Expedition to the Source of St Peter's River*, p. 190, by W. H. Keating. G. J.

Poa Nervosa.—Has the *Poa nemoralis*, var. *nervosa*, or the Hudson Bay meadow-grass, come into use ? It is stated " to possess a property which is common to no other grass cultivated in Scotland, viz. that of the flower-stem, after being cropped, reproducing shoots from the stem as well as the root, in consequence of which it continues growing throughout the whole year." Would not this be an excellent substitute for annual rye-grass with clover. Rye-grass does not grow after being cut, and the second crop consists entirely of *clover*, and has little or no value excepting as *green food ;* but the second crop of clover and Hudson Bay meadow-grass might, perhaps, be nearly as weighty and valuable as the first. I may add, that rye-grass is nearly three weeks *too early* for clover. It grows in pretty cold weather, and is in flower generally *long before* the clover is *in bloom*, at which latter period only it is cut down, by which time the seed of the rye-grass is *nearly* or *altogether ripe*. G. J.

Proper Management of Farm-Yard Manure. By Mr John Pearson, Gardener and Planter to W. L. Childe, Esq., Kinlet, near Bewdley, Worcestershire.—On reading Mr Baker's mode of applying manure to agricultural purposes, in No. 36, vol. vii. p. 584, Miscellaneous Notices, No. 1, of this Journal, it struck me that he gave no reason why the manure should have the beneficial effect described. The reason appears to me at least to be this, that the manure contained all the essential properties it ever possessed; and though I have no doubt but the mode in question will answer very well where it can be conveniently applied, yet I am disposed to think that the essential properties of farm-yard manure may be retained and applied to agricultural purposes, under a cleaner mode of application, and with equally good effect to the crop, and very probably more likely to meet the approbation of the farmer. As it is the fashion of the day to decry long established rules and customs before new systems are perfectly modelled, I may safely declare, that it is almost impossible to conceive a more improper receptacle for manure to retain its essential properties than the generality of farm-yards. Let any reflecting man look into one of these folding yards during a heavy rain in winter, and he will soon observe the drip from all the roofs of the houses collected in a deep pool among the manure. The manure thus lies macerating for several months: but the farmers say that the manure water runs on to the *meadow;* yet I can assure them that grass-roots take up liquid manure but slowly, and the quick succession of heavy rain at that season of the year does not permit the rétention of one-fiftieth part of what the dung has been deprived of. But the next deprivation of essential matter that manure generally undergoes is worse than this, which is, by throwing it up into high heaps to *rot,* but to burn would be a more proper expression. Manure getting both washed and burned, it is not surprising that it is deprived of three-fifths of its original properties. I well recollect, when a lad, of being employed to drag down one of those rotting heaps at the risk of burning my feet, as well as receiving a lasting injury to my lumbar vertebræ. Several years ago I was finding fault with an experienced agriculturist for throwing his manure too thick together, when his answer was, that he always gave his men an extra jug of cider to get them to throw it as high as the barn if they could. I asked, Don't you find the middle of the heap as white as your shirt? Yes, said he, but I never could tell how it was; and added, that it was so dry sometimes that the wind blew it out of the carts. I advised him to save his extra jug of cider, and lay up the manure only from two to three feet in thickness, and not allow a foot to be set on it; but I must not anticipate my remarks.

I think I have made out a sufficient case of condemnation against the present system of managing farm-yard manure; and any farmer that will condescend to try the following plan but once, will assuredly abandon his old practice. The plan is simply this: Let all superabundant water be kept from the manure during the time it lies in the fold-yard. This is easily accomplished, by having the barns, sheds, &c., provided with spouts to convey the water into drains or into tanks for use. The fold-yards thus rendered comparatively dry, the small quantity of manure-water that would drain from the dung would easily be contained in poreless tanks, and applied to the *meadow* at a time when the grasses were growing, and the ground dry, both of which would take up the manure before the rains came to wash it into the brooks.

When the manure is put into rotting heaps, never allow them to be more than from two to three feet in thickness, according to the goodness. What is a safe guide in this process is, to have a few sticks stuck into the heaps, and as soon as they feel warm to the hand, let the manure be turned and laid a little thinner; and should they get hot a second time, turn the manure again. This, in most cases, will be found sufficient, provided the dung and straw have been well mixed during the process of turning; and, in the course of a month or five weeks, the manure will be sufficiently rotten for every agricultural purpose, and retain nearly, if not all, its original properties; and, what is also of consequence to the farmer, it does not take quite so much labour as the old plan of throwing it as high as the barn.

Lyon's Treatise on Trees.—Turning over a parcel of old books the other day, I accidentally stumbled on "*A Treatise of the Physiology and Pathology of Trees*," &c. by P. Lyon, Edinburgh, 1816. I had before heard of the work, as it was in my recollection that a " Prize Essay" on orcharding, written by J. Hayward, Esq. was refused by the Bath and West of England Agricultural Society, because the author had omitted to give his opinion of Lyon's treatise.

This circumstance shewed that the managing committee of the society considered an exposition of Lyon's principles a necessary ingredient in an essay on the management of fruit-trees, and of which it seems Mr Hayward had no previous notice, or without doubt that gentleman would have supplied what was wanting.

Whatever the Bath Society's committee thought, or may continue to think, of Mr Lyon's opinions and practice, it does not appear that they have been generally adopted, either on the West of England or in his own country, at least by practical men. This may have happened either from the dogmatical and tetchy manner in which the author has given his opinions, or from his practice being considered by many as a positive counteraction of the law of nature. Very few books are entirely perfect; gold is often soiled with dross; and it is to be regretted that the sterling matter of the " Treatise" should have been debased by any alloy of unnecessary sarcasm or uncourteous remarks. It is impossible to justify the severity of his observations concerning those writers who have endeavoured to explain the physiology of plants by comparison with that of animals; and when he has recourse to the same line of argument and comparison himself, his representations are far from satisfactory.

He describes the manner of the accretion of dicotyledonous stems with sufficient accuracy; but he puzzles himself and his readers by introducing (notwithstanding his scorn of the use of Latin and Greek) a new term, viz. *periligneum*, signifying round the wood; but he omits to say where this same new named member is to be found, whence it cometh, or whither it goeth. Mr Lyon also states, that there is a vacancy between the alburnum and inner bark, which is the principal channel of the ascending sap, but in which it first becomes stagnant, and ultimately changed into wood, and there remains to form the new layer. Though the author is not ignorant of chemistry, he does not condescend to inform us how a simple fluid absorbed by the roots can be changed into what he calls a solid; or how unorganized water is transmutable into a highly organized membrane. Indeed, the whole of his description of the internal growth of a stem, though nearly right, is carelessly written, but which he might easily remedy if he intends to favour us with another edition of his work.

It is not my intention to notice the discrepancies of Mr Lyon's physiological ideas, because, in a practical point of view, it signifies very little how they are understood; but his grand principle of decortication, as a sound practical expedient for assisting the growth of a stunted tree, deserves more attention than has as yet been bestowed upon it.

There is nothing more certain than that both the wood and bark are only *temporary* members of the stem. After an uncertain number of years, the first, no longer connected with the system, rots at the core, and soon crumbles into dust; and the second, soon as useless as a secretory apparatus, is annually thrown off piece-meal, rent into fissures, or stretched horizontally to make room for the swelling membranes within. Now, if from any cause the outside layers of bark lose their expansive or yielding property, and become so rigid as to check the growth of the new alburnum and liber, it acts as a compressive encumbrance, and may be removed not only with safety, but with certain advantage. It is merely assisting Nature to do that which in all cases she does, or endeavours to do for herself. In the culture of the grape-vine, stripping off the useless bark is now an established practice; and there can be no doubt but that every other tree, notwithstanding the different character of their barks respectively, would be greatly benefited by relieving them of their dead scabrous bark.

Such a manipulation will appear the more reasonable, when we consider how the bark is formed. The seedling tree has one layer of bark; in the second year two layers; in the third year three; and so on for ever, as long as the tree lives. The new annual layers are always imposed close to and within the older layers. Be it remembered that the first single cuticle or bark of the seedling was then a sufficient protection to the then tender membranes of wood and pith within; and moreover was sufficient for allowing all the secretions of the plant to go on healthily. This proves that a single layer of bark is all that is absolutely necessary for carrying on the living processes of the tree; and though we know that three or more of the layers of liber, as well as a like number of alburnum in aged trees, continue to act as sap conductors for several, perhaps for many years, yet several of the outer layers of bark may be removed at any time; and all the dead layers which are not thrown off or disrupted naturally should be taken off by hand.

Methods of relieving hide-bound trees was practised long before Mr Lyon's time; but chiefly by those who, like himself, were amateur gardeners. Practical men contented themselves with merely scoring the stem and branches with the point of their knife; and this very often was a remedy, but not so completely as if the whole constrictive bark had been removed. Besides, simple scoring did not disturb the lurking places of insects; it rather gave additional facilities to the insects to hide in the cicatrices.

Next to securing a fruit-tree against the invasion of insects, by throwing upon, or thoroughly drenching it with some kind of wash, in the autumn, to prevent them choosing the tree for a winter retreat for themselves, or a nursery for their young, is Mr Lyon's plan of scraping off all the exfoliations and rugged parts of the exterior, leaving no cranny for the insertion of eggs, nor protuberance to hinder the action of the weather, or application of lime-water, or other wash that may be used.

Independent entirely of relieving the tree of an useless encumbrance, smoothing the bark to dislodge the hordes of insects, is a practice so necessary and effectual, that there cannot be two opinions concerning it; and, as already observed, it is rather surprising that it is not more urgently enjoined in gardening directories, and more generally practised by orchardists. At this present moment (27th June), in the environs of London, the standard fruit-trees look most dismally. The flower-buds were mostly injured by the severe frosts of last January, but the eggs of the little grey excavating moth remained unscathed, and are now, and have been for some weeks back, devouring every leaf, particularly of some of the best sorts of apple-trees. The rigour of the season, it is true, could not be averted; but the eggs of the insects might have been displaced and destroyed by scraping, or kept off by an autumn wash, or by an uninviting naked surface.

If Mr Lyon's book contained nothing but the advice he gives concerning the destruction of insects, it has a merit which has, I fear, been undervalued, in consequence of the intemperate tone in which his doctrines were delivered. J. M.

MISCELLANEOUS NOTICES.

I. *Proposed New Museum of the Highland and Agricultural Society of Scotland.*—This useful and enterprising Society is about to institute a Museum on a large scale, in connection with its establishment in Edinburgh. For several years the Directors have been gathering together materials for a Museum; and it appears that the collection they have formed is now sufficiently extensive to justify the erection of a handsome Building, specially designed to contain it.

It is impossible to enumerate, and it is difficult even to classify, the various objects of interest which will be displayed in this intended Museum. We may mention, however, that it will contain models of all known agricultural implements and agricultural machinery—an assortment of seeds, grains, and grasses adapted for British culture—specimens of the various kinds of timber produced by forest trees—a collection of insects and grubs known in this country as inimical to trees and plants—samples of dyes derived from native shrubs, with specimens of the shrubs themselves—specimens of minerals, ores, and rocks existing in Scotland, and adapted for useful purposes. We may add, that not the least valuable part of the materials already collected and illustrative of the physical character and physical riches of the country, consists of the Reports and Maps with relative sections explaining the geological structure of different counties, and shewing those parts of Scotland where coal, lime, ironstone, and other valuable mineral products abound. Abstracts of these have been published from time to time in the Society's Transactions. But the *original* Maps and Sections, drawn on a much larger scale than can appear in an octavo volume, may be displayed in the Museum, and will afford a mass of practical as well as scientific information no where else to be met with.

We have also to notice another very important and interesting part of the collection, which will occupy a prominent place in the new Museum. It has long been the wish of the Society to procure models and portraits of different varieties of Stock, of the most approved breeds, so as to exhibit their respective points and characters. The idea first occurred to the Directors about ten or twelve years ago; but they were then deterred from prosecuting it, by many difficulties, which, though still in part existing, they think may now be overcome. One of these difficulties was the want of good artists, who had devoted themselves to taking likenesses of animals.

But it has occurred to the Directors, that there are now several individuals, distinguished for their attainments in sculpture and painting, who would be able to perform the above-mentioned task, in a manner equally indicative of the progress of the fine arts and instructive to breeders of stock. Application has been made to several of our native artists, to know whether they would assist in forming a gallery of paintings and models, of sheep, cattle, and other agricultural stock, to be taken from the best specimens to be found in England and Scotland, and they at once and most cheerfully agreed to the proposal; and with a liberality which all must appreciate, they stated, that they would leave it to the Directors of the Highland Society themselves to fix what should be their remuneration in each case.

Such is a brief and imperfect outline of the objects of interest and instruction which the Highland Society's Museum will contain. On the great and paramount utility of such a Museum,—it would be superfluous to offer many remarks. How is it possible for any one to acquire a knowledge of minerals or metals without seeing specimens;—or of agricultural implements and machinery, without handling either the implements and machines themselves, or correct models of them;—or how can any one learn to discriminate the different breeds of stock, and to select the best, without having had an opportunity of studying the most approved specimens? These examples are sufficient to shew, that much of the knowledge which is necessary for those who are to be engaged in agriculture, and in many other of the useful arts, cannot possibly be obtained by mere description in words; and that the sight of the objects themselves, or correct representations and figures of them, will convey far more instruction than what can be gathered from whole volumes of description. Instruction obtained in this way, has another important advantage over instruction obtained by mere verbal or oral description;—it will be less easily forgotten,—because it will be associated in the mind, with the recollection of external objects—those very objects to which the instruction relates.

Such being the nature and the character of the instruction afforded by a physical Museum, illustrative of the agricultural and mineral resources of the country, it is evident that the benefits arising from it must be felt, more or less, by all classes of the community. They will be felt by the practical agriculturist in a peculiar degree, by making known to him the best of every thing which he requires in the management of a farm, and the means of obtaining it at the least expense. They will be felt by architects, builders, and mineral surveyors, in enabling them to see and to study those objects, a knowledge of which is fundamental in their several professions. We need not enumerate other trades or arts, to a better knowledge of which the intended Museum will contribute,—for those already mentioned give employment to the great majority of our population, and are above all others essential to society at large. But it is not merely those who are themselves engaged in a trade or profession, that are benefited by improvements discovered and made known in it. They derive the benefit in the first instance; but all other classes gradually and indirectly participate in the benefit. If improvements are made in the particular arts before enumerated, it is not merely farmers, and surveyors, and all whom they employ, that will profit. Landed proprietors will benefit by the increased value of their estates. Manufacturers will benefit by obtaining more cheaply and abundantly those mineral and metallic products which supply machinery and the means of moving it. All classes of society benefit, by having cheapened to them the first necessary of life, and the most cheering comforts of an English dwelling-house.

Such would be the results, both direct and indirect, of increased facilities being afforded of carrying on the particular arts and manufactures above enumerated; and no one can doubt that among these facilities, none are so important or efficacious as communicating a knowledge—cheaply and easily obtained—of the best methods of carrying on these arts and manufactures. That knowledge will be afforded by the Museum which the Highland Society is about to establish; and, therefore, it truly deserves the name, as it possesses the importance, of a great national institution.

But at whose expense, it will naturally be asked, is this Museum to be established? If the answer had been, at the expense of the nation,—sure we are that every right thinking man would have applauded such an application of the public revenue. But the funds are to be procured from another quarter,—though not from the coffers of the Highland Society. That Society, notwithstanding the extensive scale of its operations, is by no means wealthy; and all its revenue, derived from the contributions of its members, is no more than adequate for the Premiums awarded by the Society, in the course of its ordinary business. The cost of the new building, with its internal furnishings and decorations, is expected to amount to about £6000. This sum the Members of the Highland Society propose to raise by private subscription among themselves; and when the Museum is completed, they are then to throw it open to the free, the unlimited, and the gratuitous use of the public.

What a splendid act of generous and munificent patriotism! What a noble example of disinterested zeal for the good of the country! The Members of the Highland and Agricultural Society would have had no small merit in simply devising the measure, and in collecting materials for a museum, leaving it to others more opulent to erect the edifice necessary to contain it. But knowing what might be the fate of the measure in that case, the Members of this Society resolved on executing the whole themselves,—or, in other words, of making a present to the nation, of a new and most valuable institution. Truly this Society deserves the gratitude and the thanks of the country, for this addition to the many acts of service they have rendered to it. Not satisfied with stimulating, by liberal premiums, agricultural industry in every county, in every corner of Scotland—with endeavouring to improve the breeds of stocks by their magnificent shows—with inciting, by encouraging rewards, to the discovery of cheaper or better modes of tillage and culture,—with inducing men of practical science to explore the hills and valleys of our land for useful mineral products,—and with publishing quarterly, at a cheap rate, their valuable Essays and Reports, the members of this Society are about to add to this catalogue of public benefits, an Institution calculated still more fully to promote these great objects, and in which instruction may be gratuitously obtained, not by members of the Society alone, but by all classes of the community alike. Well may Scotland be proud of having such a Society as this—a Society which enrols among its members the noblest and the richest in the land—a Society, all of whose members are sincerely imbued with a desire to improve their native country—a Society, the principles and the proceedings of which have won so entirely the approbation of the wise and the good of other countries, that when similar institutions are there about to be founded, it is looked up and appealed to as a model worthy of imitation.

We have said that the cost of the new Museum is expected to be about £6000. A part of this sum has been already subscribed, though there has yet been no time to apply to the Members of the Society generally. The Directors thought it incumbent on them, not only to subscribe, in the first instance, themselves,—but to give the Office-Bearers of the Society also an opportunity of putting down their names, so that members in the different counties might see that the measure had the concurrence and approbation of those most conversant with the business and affairs of the Society. As almost all the members now referred to were resident in Edinburgh or London, it was thought that the same person who was employed to wait upon them might also wait upon such other members as might be in these cities,—and the more especially as those in Edinburgh were, from attending the general meetings of the Society, peculiarly qualified to give an opinion on such a matter. The result of this application is most gratifying. In the course of a few weeks, upwards of £2200 has been raised, consisting of voluntary donations from about 220 members—a number constituting little more than one-tenth of the whole members of the Society.

With so auspicious a commencement, we have no fears as to the success of the subscription among the members generally. For in judging of the utility of the new Museum, both in reference to the Highland Society and in reference to the country at large, every one must be strongly influenced by the circumstance of its having been cordially approved of, not only by those who are best acquainted with the proper objects of the Society, but by those who are deeply interested in the welfare and prosperity of the country. When it is considered that such individuals as the Duke of Sutherland, the Duke of Buccleuch, the Marquis of Bute, the Marquis of Lothian, the Marquis of Tweeddale, the Marquis of Breadalbane, Earls of Wemyss and Rosebery, Lord Greenock, and others, who have, as office-bearers in the Society, taken a warm interest in its business; and that, moreover, such individuals as the Duke of Sussex, the Duke of Cambridge, the Duke of Bedford, and others, not particularly connected with the Society or with Scotland, but who have a deep interest at stake to encourage all institutions which are beneficial to the country—when such individuals as these unite in approbation of the measure, and have subscribed large sums in behalf of it, few will think it necessary to inquire farther as to the utility of the intended Museum, but give at once their hearty concurrence and co-operation towards its establishment.

Under these circumstances, we entertain very little doubt, that large as the sum is which is required, it will all be subscribed by the members of this patriotic Society. We frankly add, that we hope the whole £6000 may be raised by the members of the Society exclusively: because we would wish those who have originated this measure, and who have been for years past preparing for its execution, should enjoy the credit, honour, and applause, that would follow its successful accomplishment. If it should be necessary to apply to the public for assistance, sure we are of what the result would be. There has even already in some parts of the country (where the proposal to establish the Museum has become known), been evinced a strong desire on the part of agriculturists to give assistance, both by sending specimens, and by sending money. We understand that a few weeks ago, the members of one local agricultural association commenced a private subscription among themselves, and that they have already raised £40 as was lately intimated to the Secretary of the Highland Society.

A very appropriate site has been obtained for the Museum. It is to be on a corner-stance, facing George IV. Bridge and Victoria Street, the latter being a new street leading directly to the Grassmarket. The east front will be nearly opposite the new Library of the Faculty of Advocates. It will thus be in the immediate neighbourhood of several places of public resort, such as the Courts of Law, the County Buildings, and the University. The appropriateness of this site is still more strongly indicated by its being close to the Grassmarket and the Royal Exchange (being about mid-way between each), where so many agriculturists have occasion to be every week.

The largest apartment in the building, or great hall of the Museum, is to be 55 feet in length, 32 in breadth, and 25 in height. There will be a range of four high windows along the side facing the bridge, and five of the same character facing Victoria Street. This Hall will be devoted chiefly to the exhibition of models of agricultural implements and machinery, as also of models and paintings of animals. As to the manner in which the other apartments will be occupied—we believe nothing has yet been definitively arranged. But we may mention, that one apartment is to be fitted up as a library and reading-room for the use of members of the Society;—and which will contain the valuable collection of works on agriculture, and of Maps illustrative of the topography of Scotland, belonging to the Society.

We think that Edinburgh has been most fitly and properly chosen for the establishment of this national Institution. If it was to be in connection with the Highland Society, and under the superintendence of its Directors, it could be no where else. But, even if it had been proper and possible to have established it independently of the Highland Society, there are special reasons for its being in Edinburgh, in preference to any other town in the empire. In the University of Edinburgh there is a Chair of Agriculture, from which are delivered lectures, that are attended by a considerable number of Students. We believe that in no other University in the United Kingdom is there any similar Professorship. There exists also in Edinburgh an excellent Veterinary School, which was established some years ago by the Highland Society, where lectures are annually given on the anatomy and diseases of the horse, and other domestic animals. Now it is almost unnecessary to observe, that the lectures on both of these subjects may receive the very greatest assistance, in the illustration of them, from the intended New Museum. Indeed, such a collection as it will contain is absolutely essential to render these lectures on many important points intelligible to the students.

These reasons alone very emphatically suggest Edinburgh as the most fit and appropriate place for the establishment of this national institution. Our fellow-townsmen must rejoice at the prospect of that establishment, as being likely to raise still higher the reputation of Edinburgh as a seat of learning and a place of interest;—our fellow-countrymen every where must rejoice at this new and great boon that is about to be given to Scotland;—and all will accord in one sentiment of gratitude and of respect to the Highland Society, by whose members that boon is so liberally and so patriotically bestowed.

II. *Manufacture of Cheese from Potatoes.*—Cheese, it is said, of extremely fine quality, is made from potatoes in Thuringia and part of Saxony, in the following manner:—After having collected a quantity of potatoes of good quality, giving the preference to the large white kind, they are boiled in a cauldron, and after becoming cool, they are peeled and reduced to a pulp, either by means of a grater or mortar. To five pounds of this pulp, which ought to be as equal as possible, is added a pound of sour milk, and the necessary quantity of salt. The whole is kneaded together, and the mixture covered up and allowed to lie for three or four days according to the season. At the end of this time it is kneaded anew, and the cheeses are placed in little baskets, when the superfluous moisture is allowed to escape. They are then allowed to dry in the shade, and placed in layers in large pots or vessels, where they must remain for fifteen days. The older these cheeses are, the more their quality improves. Three kinds of them are made. The first, which is the most common, is made according to the proportions above indicated; the second, with four parts of potatoes, and two parts of curdled milk; the third, with two parts of potatoes, four parts of cow or ewe milk. These cheeses have this advantage over other kinds, that they do not engender worms, and keep fresh for a great number of years, provided they are placed in a dry situation, and in well closed vessels.

III. *Importation of Cattle into France.*—The Council-General of Agriculture, Commerce, and Manufactures, have held a joint meeting, to discuss the reduction of the import duty on foreign cattle. It appears that, at the beginning of 1816, no duty of the kind existed, and it was only in April of that year that a duty of three francs per head, increased in 1822 to five francs, was laid on. This duty still exists, and, since the time of its imposition, the numbers of foreign cattle imported have gradually diminished, until, in 1836, they were as follows:—Oxen, 8347; cows, 11,621; calves, 10,292; sheep, 144,282; of which no part was consumed in Paris. Since 1822, whether from the operation of this duty, or from other causes, it is certain that the consumption of cattle in France has decreased. Thus, according to the "Archives Statistiques," published by the Minister of Commerce, 350 towns which, in 1816, possessed a total population of 3,922,238 souls consumed annually 397,771,300 lbs. of meat, giving about 101 lbs. annually to each individual. But, in 1833, we find that 376 towns, with a total population of 4,803,516 souls, consumed 484,663,660 lbs., which gives 100 lbs. as the annual average to each person. In Paris, too, in 1825 and 1826, the annual consumption of each individual was 126 lbs.; but, in 1836, only 114 lbs., in which quantities are included constantly increasing portions, now about 14 lbs. or 16 lbs., of pork and salted meats. In 1820, the average market price of the ox in the country was 39 centimes, or 3¾d. per lb., and, in 1833, it was 42 centimes, or 4d. per lb. The price of other animals has risen in a similar proportion. In Paris, prices have risen still more, the average price of the ox being, in 1835, 54 centimes, or nearly 5¼d.

per lb. It appears, therefore, that an increase of price has brought about a diminution in consumption, in Paris at least, though not in all parts of the country. In Normandy, especially, the peasantry live much more on meat than they used to do, although the average consumption is still small. At the present time, it is calculated that the daily consumption of a family of five persons, in the country, is only two-fifths of a pound; whereas, in Paris, for a family of three persons, it is a little more than four-fifths of a pound. It is expected that the reduction of the import duty will be recommended by the Council-General, on the weight, and not the number of cattle.—*Galignani's Messenger.*

IV. *Geese as barometers.*—A recent tourist in the Highlands mentions a novel mode an inn-keeper had of ascertaining what would be the state of the weather:—"He has only to send his fleet of geese to the loch-side, and if they put out to sea, it will be fair; if they anchor on shore, it will be rainy."

V. *Improvement in Glass.*—Richard Baker and Son, of Ossett Street-side, near Dewsbury, have discovered an improvement in the manufacture of glass, and have it so pliable that they can make a cloth or fabric of the finest texture. They have pieces of this glass 2¼ yards long, and from 9 inches to 36 inches in breadth; they have also made some very fine ladies' head-dress or ornaments from this material, which are considered both very curious and very useful.—*Leeds Intelligencer.*

VI. *Acoustic Telegraph.*—A new telegraph has been invented in Austria by M. Kieninger. It is an acoustic telegraph, cnosisting of a tube in the form of a speaking-trumpet 6 feet 5 inches long, which conveys the sound in 11 and 1-10th seconds to a distance of 12,000 feet. A trial made of this instrument at Vienna proved very satisfactory. The government intends to employ it in the army for the purpose of conveying military orders to troops dispersed over a great tract of land, &c.—*National.*

VII. *Strength of Liquors.*—The liquor which contains most of the pure spirit of alcohol is Scotch whisky, being upwards of 54 per cent. Contrary to what is generally supposed, the proportion of alcohol in rum is greater than that contained in brandy; the former being 53.68, and the latter 53.39. The next liquor in order of strength is gin, which contains about 51½ per cent. of alcohol. Port and Madeira contain much about the same quantity, namely, 22 per cent.; cider contains nearly twice as much as London porter, being as 7.54 to 4.20; brown stout and Scotch ale contain each about 6¼; while Burton ale can boast of nearly 9 per cent.

VIII. *Galvanic Telegraph.*—The highly scientific mode of making instantaneous telegraphic communications by galvanic power, which has so long been considered attainable, has already been put to the most decided test on the London and Birmingham railway, under the direction of Professor Winston and Mr Stephenson, the engineer to the company. Four copper wires, acted upon at each end of the line at pleasure, by the agency of very simple galvanic communicators, have been laid down on the line of the London and Birmingham railroad, to the extent of twenty-five miles. They are inclosed in a strong covering of hemp, and each terminus is attached to a diagram, on which the twenty-four letters of the alphabet are engraved, in relative positions with which the wires communicate, by means of movable keys, and indicate the terms of the communication. The gentlemen are fully satisfied that communications to almost any extent may be made instantaneously by the agency of galvanism.

QUARTERLY AGRICULTURAL REPORT.

August 1838.

As we experienced very fine weather last summer after the severe winter, so after the last still more severe winter, we expected as fine a season, but we find there is no analogy between seasons. It is not an easy matter minutely to describe the weather of the bygone summer, there having been so many and varied changes, even in the course of a single day. It may, however, be generally characterized as unpropitious to field crops, not so much from absence of warmth,—only warmth not heat,—as prevalence of rain and cloudy skies. The sky had—has yet—an awning of vapours stretched across it, and only when the wind occasionally blew rents in it, could the sun be permitted to smile upon the earth. Meantime vegetation proceeded unchecked night and day, and though plants shew all the weakness, they want the development of luxuriance, such as is seen in the tropics, which they displayed last year. We may truly say Summer has postponed her visit this year. Spring prolonged hers, and has endeavoured to fulfil Summer's gracious duties. Autumn now maintains her own prerogative, despite of Sol's displeasure.

Were we to judge of the spring crops from the condition the land was in when they were consigned to the earth, we should be disposed to judge of them favourably. The rule is not safe for our guidance this year. Oats, barley, and potatoes, received a dry bed, and turnips a very wet one. The oats are a fair crop every where,—liking a dripping season,—but in the upper districts they will be late, late. Barley is also pretty good on dry, easy soils; on strong and poor clays, thin. Every where we hear of a luxuriant crop of this grain throughout England. Potatoes, though well lodged in the bed, are puny on the east coast; on the west they display luxuriance; and yet, unless the season yet prove dry, they cannot be mealy. Mention has again been made of failure amongst potatoes. Such is no doubt the case to some extent, and it has been observed to affect higher ground than formerly. From what we have seen, many of the instances of failure may be ascribed to water standing in the hollow portions of the fields. Water did it most undoubtedly, though not standing visibly above the potato drills; but it *was* there after rain in a stagnant state below the drills, and just in such spots as it would remain concealed in a wet season, on land that had not been thorough drained. We are not going to maintain that thorough draining would entirely prevent the recurrence of the failure; but sure we are, it would have saved the crop in places where failures have occurred this season. Swedish turnips sown early before the rains began to fall, intermittingly, may be a fair crop, October being the swelling month for the turnip. On the east coast, all turnips, including late Swedish, being stinted, and in many places deficient in plants, cannot now so far recover as to prove a full crop; though those in the west coast are all good. Wheat looks well every where; and, though thin on poor soils, it is large-eared. Were this climate productive of rust or mildew in wheat, this summer would have been a pre-eminent nourisher of that disease; but we hear few complaints of it even from England, which leads us to suppose that the character of the English summer has been better than ours. We fear, however, the wheat crop will not sustain its external appearance; for, on examination, it is found to be partially injured by the maggot of the turnip-fly which annoyed us so much some years' since. The ravages of this maggot are grievously complained of in the west and south-west of England. Besides, wheat cannot be expected to yield prolifically in flour, in a sunless season, though it may fill the bushel; its quality cannot be fine. Pease and beans blossomed well, and will be full enough in straw; but hitherto in late seasons they have never proved prolific crops. All the white crops are highly spoken of in the Border counties of both countries.

Upon the whole, there will be bulk enough of all sorts of grain to do more than supply the internal wants of Scotland, but there cannot be fine quality; and the fate of a late harvest is always to be dreaded by those who experienced the sufferings of the farmer in the harvests of 1816 and 1817. Still this season is neither so late nor so wet, nor the crop so bad, as in either of those years; it approaches more in character to the season of 1828; and let us never forget, that the improved condition of the soil is now so much superior to what it was in 1828, and much more so than in 1817, that the same degree of wet and cold weather can never again produce the same injurious effects.

Hay on the east coast is a fair crop, and is cheaper in price than it has been for a few years; that on the west coast is certainly below an average. The pastures have been more flushy than feeding. The hill pastures, we understand, are good. Stock of all kinds realized pretty good prices through the summer, but the certainty now of the turnip crop being deficient, their prices have been giving way for some weeks. The turnip crop in England, on the other hand, is pronounced good, in which case the autumnal prices will certainly not recede much. The severe winter and spring have stinted the lambs from the hills, they are not so good as last year. Wool has again taken a spring, equal fully to that of the year before last, in the expectation of the Americans again shewing face in the market of woollens.

A remarkable activity and anxiety have pervaded the corn markets for the last half-year. The late harvest of this, and the rather scanty crop of last year, have combined to reduce the stock of wheat in the hands of farmers and millers to such a pitch, as to raise its price higher than it has been since 1828. Eighty shillings a quarter for fine wheat is now no uncommon price. A number of those shillings have, no doubt, been lately imposed by combination among the speculators in foreign corn throughout the country, to reduce the import duty; and they have succeeded in reducing it so low as 13/8 a quarter, and it is expected to be not higher than 1/ before the new crop can be available. According to the Bank Circular, a crowd of ships are at present thronging the port of Danzig, from which alone 400,000 quarters are expected to be shipped. Shipments for this country are also going on at Hamburg. The consequence has been, the demand for foreign corn has rapidly raised prices in the foreign ports. As high as 65/ have been asked at Hamburg. The crops and weather in the north of Europe being represented to be both bad and late, the new crop cannot soon be brought to market. Meantime, of the old grain, from 300,000 to 400,000 quarters have been supplied from the northern ports, and about 300,000 quarters more can be obtained from the Mediterranean and Black Sea, should they be required. What, after all, are these quantities, together with the 600,000 quarters in bond, to our consumption? Let it come when it is really wanted, and welcome. The merest caviller against the corn laws, now that they are really in operation, cannot deny that they work well; that they supply us with foreign grain when it is really wanted, and exclude it when it is not. We have no desire to see a perpetuation of the present prices of corn, not because they will raise wages, for the wages of the really hard-working labourer are too low, but because they tend to excite discontent amongst that class of operatives who receive the highest wages, and amongst manufacturers, whose continual effort is exerted to reduce the wages of work people, in order to obtain the higher profits to themselves. We refer to the Tables for the current prices of agricultural produce, and of the foreign corn in bond.

THE REVENUE.

ABSTRACT of the Nett Produce of the Revenue of Great Britain, in the Quarters and Years ended on the 5th *of July* 1837, *and* 5th *of July* 1838,—*shewing the Increase and Decrease on each head thereof.*

	Quarters ended July 5.		Increase.	Decrease.	Years ended July 5.		Increase.	Decrease.
	1837.	1838.			1837.	1838.		
	£	£	£	£	£	£	£	£
Customs, ..	4,430,385	4,769,400	339,015	..	19,290,605	18,790,464	..	500,141
Excise,....	2,663,564	2,437,112	..	226,452	12,163,800	11,439,296	..	724,504
Stamps,...	1,647,039	1,692,134	45,095	..	6,583,771	6,506,980	..	76,791
Post-Office,	356,737	381,000	24,263	..	1,471,737	1,544,006	72,269	..
Taxes,....	1,609,409	1,609,508	99	..	3,720,175	3,627,204	..	92,971
Miscellaneous,	5,727	10,390	4,663	..	48,174	39,106	..	9,068
	10,712,861	10,899,544	413,135	226,452	43,278,262	41,947,056	72,269	1,403,475
	Deduct Decrease,		226,452		Deduct Increase,			72,269
	Increase on the quarter,		186,183		Decrease on the year,			1,331,206

TABLES OF PRICES, &c.

The Average Prices of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets :—

LONDON.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1838.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
May 4.	60 9	31 2	22 8	30 4	33 8	33 11
11.	62 2	29 6	23 3	31 2	34 2	33 11
18.	64 0	30 6	23 5	31 6	34 6	34 9
25.	63 8	33 1	23 7	31 4	35 2	35 6
June 1.	64 9	32 0	23 9	32 0	35 6	35 4
8.	65 9	32 9	23 8	32 7	36 0	36 0
15.	66 4	32 0	23 2	32 4	36 6	35 0
22.	67 0	32 5	23 0	33 1	35 10	35 11
29.	69 8	31 8	23 3	33 3	35 8	35 11
July 6.	68 9	32 8	22 10	33 8	36 2	35 7
13.	69 0	32 2	23 0	34 4	36 10	35 0
20.	69 2	33 0	23 0	35 2	35 8	35 6
27.	69 6	31 9	23 2	35 9	35 6	36 4

DUBLIN.

Date.	Wheat Per Bar. 20 St.	Barley Per Bar. 16 St.	Bear Per Bar. 17 St.	Oats Per Bar. 14 St.	Flour Per Bar. 9 St.
1838.	s. d.	s. d.	s. d.	s. d.	s. d.
May 4.	37 6	16 6	14 6	12 6	19 6
11.	38 1	17 6	15 2	12 11	20 3
18.	39 4	18 0	15 6	13 9	20 6
25.	39 9	18 1	15 3	13 0	20 6
June 1.	39 1	17 6	15 0	12 2	21 1
8.	38 0	16 6	14 2	13 2	20 9
15.	37 10	16 2	14 0	12 5	20 11
22.	37 4	16 0	14 4	12 1	20 11
29.	39 7	16 6	14 2	12 8	21 4
July 6.	39 1	16 8	14 6	13 1	21 5
13.	39 5	16 9	14 4	12 6	21 4
20.	41 9	17 2	14 6	13 4	21 10
27.	43 4	17 6	15 2	14 0	22 4

LIVERPOOL.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1838.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
May 4.	61 3	31 9	21 7	31 10	33 1	39 5
11.	60 6	30 0	21 6	31 8	33 6	40 1
18.	61 10	33 9	22 2	31 6	34 4	39 8
25.	63 7	28 8	22 4	32 0	35 11	39 9
June 1.	63 5	28 11	22 2	32 6	34 6	40 11
8.	65 4	32 0	22 6	32 10	35 2	39 3
15.	67 5	32 8	22 3	33 3	35 6	40 0
22.	65 8	32 2	22 0	33 9	36 2	39 11
29.	66 2	33 8	21 6	34 1	36 4	40 9
July 6.	69 4	32 7	22 5	34 6	36 1	41 9
13.	70 0	32 2	21 10	35 2	35 9	40 10
20.	69 1	32 7	22 1	35 6	35 6	40 4
27.	69 10	31 5	21 7	35 10	36 0	40 2

EDINBURGH.

Date.	Wheat.	Barley.	Oats.	Pease.	Beans.
1838.	s. d.	s. d.	s. d.	s. d.	s. d.
May 2.	68 0	33 7	24 10	37 6	38 0
9.	67 0	34 2	26 0	37 6	38 2
16.	67 4	34 0	25 2	37 7	38 1
23.	67 0	35 6	25 6	38 0	38 4
30.	66 4	36 0	25 7	38 4	38 8
June 6.	67 6	36 2	26 6	38 6	39 0
13.	68 7	36 0	26 9	38 6	39 2
20.	69 3½	36 6	27 0	39 0	40 0
27.	68 0	37 2	28 1	41 6	42 0
July 4.	71 2½	37 6	29 0	42 3	43 3
11.	70 8½	38 0	29 1	42 0	43 0
18.	72 9	58 6	29 4	42 4	43 6
25.	76 7	38 8	29 0	42 6	43 6

TABLE shewing the Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. IV. c. 58, and the Aggregate Averages which regulate the Duties payable on FOREIGN CORN; the Duties payable thereon, from May to July 1838.

Date.	Wheat.			Barley.			Oats.			Rye.			Pease.			Beans.		
	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.
1838.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
May 4.	60 0	58 10	28 8	30 1	29 10	18 4	22 0	21 8	15 3	31 4	31 11	22 9	33 8	33 1	19 9	34 11	34 [illegible]	18 3
11.	60 10	59 4	27 8	29 10	29 11	18 4	22 0	21 9	15 3	31 3	31 8	22 9	34 4	33 4	19 9	36 4	34 10	18 3
18.	62 2	59 11	27 8	30 2	29 11	18 4	22 8	22 0	13 9	32 6	31 10	22 9	34 4	33 6	19 9	36 5	35 [illegible]	16 9
25.	62 4	60 6	26 8	31 2	30 2	16 10	22 8	22 2	13 9	33 9	32 2	21 3	34 5	33 11	19 9	37 0	35 [illegible]	16 9
June 1	63 1	61 3	25 8	31 2	30 4	16 10	22 9	22 4	13 9	33 11	32 7	21 3	35 5	34 4	18 3	37 4	36 1	15 6
8.	64 9	62 2	24 8	31 4	30 7	16 10	22 10	22 6	13 9	33 8	32 9	21 3	36 5	34 9	18 3	37 7	36 7	15 6
15.	64 11	62 11	24 8	31 4	30 10	16 10	22 7	22 7	13 9	34 5	33 3	19 9	36 11	35 4	16 9	37 5	37 [illegible]	14 0
22.	65 6	63 9	23 8	30 11	31 0	15 4	22 7	22 8	13 9	33 9	34 0	18 3	35 8	35 6	16 9	37 7	37 5	14 0
29.	67 3	64 7	22 8	31 2	31 2	15 4	22 9	22 8	13 9	36 3	34 7	18 3	35 10	35 9	16 9	37 6	37 5	14 0
July 6.	68 9	65 6	21 8	31 10	31 3	15 4	22 7	22 8	13 9	36 3	35 0	16 9	36 11	36 2	15 6	37 8	37 [illegible]	14 0
13.	68 0	66 4	20 8	31 5	31 4	15 4	22 11	22 9	13 9	34 7	35 2	16 9	36 1	36 4	15 6	37 5	37 [illegible]	14 0
20.	68 2	67 0	18 8	32 5	31 6	15 4	22 10	22 8	13 9	35 9	35 6	16 9	35 4	36 1	15 6	37 3	37 [illegible]	14 0
27.	69 1	67 8	18 8	31 8	31 7	15 4	22 10	22 9	13 9	36 4	35 10	16 9	34 4	35 8	16 9	38 2	37 [illegible]	14 0

Fiars' Prices for Crop 1837, County of Edinburgh—Erratum on p. 157 (former Numl
for Wheat, First, 54/0 *read* 54/7

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the Quanti Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; the Qua upon which duties have been paid for home-consumption, during the same Month; and the tities remaining in Warehouse at the close thereof, from 5th May to 5th August 1838.

Month ending	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN WAREI	
	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.
May 5. 1838.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, .	1,308 5	..	1,308 5	1,549 1	..	1,549 1	498,592 1	5,961 3
Barley, .	70 7	..	70 7	33 3	..	33 3	29,251 5	..
Oats, . .	986 0	..	986 0	28 6	..	28 6	237,537 7	..
Rye, . . .	..	..	..	1,363 6	..	1,363 6	6,168 4	..
Pease, . .	96 3	..	96 3	17 6	..	17 6	19,178 5	11 3
Beans, . .	..	..	..	10 0	..	10 0	4,959 4	..
Totals, .	2,461 7	..	2,461 7	3,003 6	..	3,003 6	795,688 2	5,972 6
June 5.								
Wheat, . .	25 259 4	0 1	25,259 5	98 3	633 5	732 0	521,905 6	5,327 7
Barley, . .	11 6	..	11 6	0 1	..	0 1	26,430 7	..
Oats, . .	4,104 5	..	4,104 5	48 2	..	48 2	236,950 3	..
Rye, . . .	..	..	..	..	..	..	5,322 5	..
Pease, . .	713 7	0 3	714 2	21 4	0 3	21 7	19,335 3	11 3
Beans, . .	1,970 3	..	1,970 3	..	..	..	6,905 5	..
Totals, .	32,060 1	0 4	32,060 5	168 2	634 0	802 2	816,850 5	5,339 2
July 5.								
Wheat, . .	56,952 0	..	56,952 0	238 5	215 0	453 5	578,123 2	5,112 7
Barley, . .	1,003 3	..	1,003 3	200 0	..	200 0	26,083 3	..
Oats, . .	6,497 5	..	6,497 5	9 7	..	9 7	238,635 0	..
Rye, . . .	..	..	..	..	..	..	5,322 5	..
Pease, . .	1,920 2	0 5	1,920 7	11 3	12 0	22 3	20,844 1	..
Beans, . .	10,793 3	..	10,793 3	..	..	..	17,714 0	..
Totals, .	77,166 5	0 5	78,167 3	459 7	227 0	685 7	886,722 3	5,112 7
May 5. 1838.	cwt. qr. lb	cwt. qr. lb	cwt. qr. lb	cwt. qr. lb	cwt. qr. lb	cwt. qr. lb	cwt. qr. lb	cwt. qr. lb
Flour, . .	17,360 0 14	302 2 21	17,662 3 7	3 0 6	1,119 1 20	1,122 1 26	110,284 2 11	13,240 2 11
Oatmeal, .	1,528 2 0	..	1,528 2 0	..	..	..	366 3 17	..
Totals, .	18,888 2 14	302 2 21	19,191 1 7	3 0 6	1,119 1 20	1,122 1 26	110,651 2 0	13,240 2 11
June 5.								
Flour, . .	31,325 2 15	4,777 0 25	36,102 3 12	112 2 5	7,602 3 11	7,725 1 16	103,156 1 14	10,414 3 25
Oatmeal, .	419 3 4	..	419 3 4	..	..	..	395 3 3	..
Totals, .	31,745 1 19	4,777 0 25	36,522 2 16	112 2 5	8,602 3 11	7,725 1 16	103,552 0 17	10,414 3 25
July 5.								
Flour, . .	11,573 0 22	561 0 3	42,134 0 25	132 1 8	1,262 2 25	1,395 0 5	110,803 3 12	9,713 1 3
Oatmeal, .	60 1 17	..	60 1 17	..	..	..	420 2 21	..
Totals.	11,633 2 11	561 0 3	42,194 2 14	132 1 8	1 262 2 25	1,395 0 5	111,224 2 5	9,713 1 8

PRICES of BUTCHER-MEAT.

Date.	SMITHFIELD, Per Stone of 14 lb.		MORPETH, Per Stone of 14 lb.		EDINBURGH, Per Stone of 14 lb.		GLASGOW, Per Stone of 14 lb.	
	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutto
1838.								
May	6/6 @ 7/6	6/6 @ 7/9	6/3 @ 7/3	6/6 @ 7/6	6/3 @ 7/3	6/ @ 7/6	6/6 @ 7/6	6/3 @ 7
June	6/9 7/9	7/6 8/	6/ 7/6	6/6 7/6	6/ 7/6	6/3 7/3	6/3 7/3	6/
July	6/9 8/	7/6 8/6	6/6 7/9	6/6 7/9	6/3 7/6	6/6 7/3	6/3 7/6	6/3

PRICES of English and Scotch WOOL.

ENGLISH, per 14 lb.—*Merino*, 27/6 @ 30/; in Grease, 17/ @ 22/6.—*South Down*, 21/6 @ 26/6; *Leicest* Hogg, 17/6 @ 24/6; Ewe and Hogg, 16/6 @ 21/6.—*Locks*, 12/ @ 14/; *Moor*, 8/6 @ 13/6.

SCOTCH, per 14 lb.—*Leicester*, Hogg, 16/6 @ 24/6; Ewe and Wether, 16/6 @ 21/6.—Ewe, 12/6 @ 18/; *Cheot* White, 17/ @ 21/; Laid, Washed, 12/6 @ 15/6; Unwashed, 10/ @ 12/6; *Moor*, White, 8/6 @ 10/6; Laid, Wa ed, 7/6 @ 9/6 Unwashed, 6/ @ 7.

THE
QUARTERLY
JOURNAL OF AGRICULTURE.

AGRICULTURE OF HINDOSTAN.—NO. III.

> Divine in hookas, glorious in a pipe
> When tipp'd with amber, mellow, rich, and ripe;
> Like other charmers, wooing the caress
> More dazzlingly when daring in full dress;
> Yet thy true lovers more admire by far
> Thy naked beauties—Give me a cigar!—BYRON.

TIME flies—yet we should have hardly thought that a year had already elapsed since we directed our readers to the state and prospects of agriculture in our Eastern provinces. Variety, however, is the soul of all periodical literature; and if we have for a season turned from rice to wheat,—from maize to barley,—and from sugar-cane to potato, it is that we may be followed with a greater zest through the remainder of what we have to say regarding Hindostan and its produce.

We pass therefore from rice, coffee, and maize, to tobacco, tea, and indigo, reserving silk, and such spices and drugs as engage the attention of the Indian farmer, for the concluding paper of this series.

Tobacco.—Of the genus of plants termed *Nicotianæ*, of the order of *Monogynia*, there are seven species, but only one comes under our notice here, the *Nicotiana tabacum*; and of it, two varieties have been cultivated, the Orinoco, and the sweet-scented tobacco. They are very similar in appearance, and differ principally in the form of their leaves,—those of the latter being broader and shorter. The leaves are light-green, and grow alternately at intervals of two or thre inches on the stalk, which is strong and erect, attaining height of from six to nine feet. The lower leaves grow t the extent of twenty inches, and they decrease in size as the ascend, those at top being about ten long and five broac We speak with reference to the plant at full growth. Th young and tender leaves are rather smooth, and of a dee green colour, but become yellower and rougher as the seaso of maturity advances. The extremities of the stalks ar surmounted by clusters of flowers, which are yellow externall and are within of a delicate red. As these fade, kidne shaped capsules succeed, each containing on an average thousand seeds. A single plant has been known to contai many hundreds of these, so that its produce may be fror three to five hundred thousand seeds.

Although tobacco be very generally cultivated throughou the East, and more especially in the northern and wester provinces of India, and although no plant of European prc duction is in such general request there, its consumptio being almost universal among the inhabitants, yet it is i many respects inferior to that of American growth. Thi however, we feel assured is much more attributable to th want of skill in the curers, than to the soil or climate Hindostan, and may doubtless be remedied by superior car and attention on the part of cultivators.

The Javanese annals inform us, that the smoking of tc bacco was first introduced into that island at the very com mencement of the seventeenth century. The plant is how ever true to its more northern origin, and will not arrive a perfection in the hot plains and valleys, unless it has bee first raised from seed upon the cooler mountainous tract Two distinct classes of husbandmen are therefore required i its culture. The seedlings reared on the hills are sold to th lowland farmers, under whose care it comes to maturity, an seeds again resold by them to their hill friends. Unless thi plan be adopted, the plants are sure to degenerate.

No other proof need be mentioned of the extraordinar fertility of the valleys of Java, than the circumstance th two crops are taken annually from the finer lands, the one rice and the other of tobacco, after which the fields are again laid under water, and sown with rice. This submersion is the only dressing that the soil receives, and its only relief an occasional half-year's fallow. The tobacco seedlings are transplanted in June, and the crop is reaped before the setting in of the rains, in October and November.*

Tobacco requires a rich soil, and it will not thrive on inferior lands; and it is only on this principle that particular districts enjoy superior reputation for its successful culture.

The ground is first prepared for its reception by being broken up with hoes, and the clods worked, until sufficiently pulverized. The mould is then drawn with the hoe round the projected leg of the labourer, until it forms a mound reaching to his knee. The leg is then withdrawn, and he proceeds to form another, and another mound, until the whole ground has been gone over. These hillocks are made to run in lines, three or four feet apart from each other, in every direction.

The plants, which have been reared from the seed with great care and diligence, being tender, and unable to stand much cold, thereby requiring a covering of mats at the least threatening of frost, are taken out of the ground, when it has been sufficiently moistened by rain, when the fourth leaf has spouted, and the fifth is just appearing, and conveyed to the field in baskets, one plant being dropped at every hillock; while a person immediately follows, who, with his finger, makes a hole in the centre, and places the plant in it, carefully firming the ground with his hand, and in such a manner as not to hurt the leaves, which are easily injured.

---

* With regard to the fertility of Java, we copy the following remarks from Mr Richardson Porter's admirable work:—"The fertility of the soil over nearly the whole surface of the island, is such," he says, "that if the industry and agricultural knowledge of the inhabitants were at all commensurate with it, no spot of equal extent, on the known habitable globe, would exceed, or perhaps even equal Java, in the variety, the quantity, or the value of its vegetable productions. For the most part, however, the land is either wholly neglected, or subjected to very inefficient modes of husbandry, a state of things which may be referable, in some degree, to the very advantage here pointed out, and which, as it enables the inhabitants, by means of an inconsiderable amount of toil, to provide sufficiently for the few natural wants to which their desires are limited, encourages that spirit of indolence, so liable to be induced by the climate. It is to be feared, however, that other causes are at work to repress their industry, and that the salutary and enlightened regulations of Sir Stamford Raffles, are not continued by its present possessors. The Dutch, although generally clever, and successful in the prosecution of commercial enterprizes, and by no means chargeable with apathy on the subject of good government at home, have never been fortunate in their management of distant colonies. * * * Their system has been restriction, instead of encouragement; they have proved themselves the taskmasters, rather than the protectors of those among whom they have settled."—*Trop. Agriculturist*, 165–6.

If there be much moisture in the soil, it will be evident, in a very few days, that the sprouts have taken. Such as have not, are withdrawn, and their places supplied by others, a favourable shower being waited for.

No crop requires greater care and attention, through the whole course of its growth, than tobacco. The plants must be continually weeded and earthed up, and any dead leaves, which may be discoverable about them, must be carefully shred away and removed. When the plants have attained the height of two feet, the flower branches appear, and the operation of *topping* must then be gone through, lest too much of the nourishment should go to the flower and seed, depriving the leaves of their strength and power. It is also necessary to remove from time to time all suckers, or superfluous shoots; and this is done by the finger and thumb nail. Grubs, and other destructive insects, must also be carefully removed, as they appear. Some cultivators keep flocks of turkies for this purpose,—the caterpillars being especial favourites with these biped gourmands.

The disease termed *firing*, is a blight which takes place from long continued drought. The plants withering and dying out in particular spots.

When ripening, the plants change their colour, from a dark to a yellowish-green, and the fibres of the leaf thicken and become more prominent. The time for cutting and gathering in requires an experienced eye; but this should not be unnecessarily deferred,—the touch of frost producing entire destruction.

The plant is cut near the ground, and if the stem be thick, it is then split down the middle, that the leaves may be more effectually exposed to the air in the process of curing. In this state the plants are left on the ground, until sufficiently exposed to the drying rays of the sun. After this, they are gathered into a barn, whose sides are constructed so as to admit a partial circulation of air. Poles, four feet apart, are stretched horizontally across from wall to wall, and these again intersected with what are called *tobacco-sticks*, on which the leaves are hung to be cured. This is done by suspending the plants by the split which has been made in the field, at cutting time. The air is generally sufficient for the purpose of curing; but if the weather is unusually moist, small fires of bark, or rotten wood, are used in different parts of the barn, care being taken that the heat is not too great, as something resembling the disease of firing may be thus induced.

In four or five weeks from the time that curing has commenced, the tobacco is said to be in case; that is, the leaves are tough and elastic, and covered with a glossy moisture. The first damp day is then chosen for stripping the leaves from the stalks, which are distributed into three heaps, according to their qualities. Small bundles are then tied together at their thickest ends, by means of a leaf tightly wrapped round them. This fasciculus is termed a *hand*, and is about the thickness of a thumb.

The little bundles are then thrown together on a platform, to undergo the operation of sweating,—a process in which a slight degree of fermentation is created. When this has subsided, the leaves again acquire their elasticity, and the tobacco is considered fit for shipment. In packing tobacco for this purpose, mechanical pressure is necessary, both for the preservation of the quality of the leaf, and to lessen the expense of transporting it, by diminishing the space occupied. The principle of any contrivance for compression in this case, must be by a lever of the second kind, the fulcrum being at one end, the power applied in the centre, and the compressing weight between these.

“ Although tobacco will grow and arrive at perfection in all warm and temperate climates,” says Mr Porter, “ it succeeds far better in some situations than in others. With the exception of a small spot in the island of Martinico, where that peculiar flavoured leaf, celebrated under the name of Maccuba, is produced, the tobacco of Cuba is perhaps the finest in the world. The produce of the Rio-Negro, and of Cumana, is also of a superior aromatic quality. That known in commerce, as Varina's tobacco, and which is grown in the Nuevo-Reyno de Grenada, has likewise acquired a high reputation."

From Mr Trevelyan's "Report upon the Inland Customs, and Town Duties of the Bengal Presidency," we learn, that tobacco, if exported in British bottoms, and to the United Kingdom, is subjected to no duties; but if conveyed in foreign bottoms, five rupees per cwt. are exacted. It is subject to the same duty if exported in British bottoms to other countries; and ten rupees per cwt. if in foreign bottoms to foreign countries.*

Having given this outlinear account of the cultivation and preparation of tobacco—that weed whose praises have been hymned from the days of Sir Walter Raleigh, down to those of Lord Byron and Charles Lamb, we pass to another still more popular favourite, the infusion of which has been so sweetly sung by Cowper, as

——— "the cup
Which cheers, but not inebriates"—

that plant, which is called *tcha* or *theh* by the Chinese; *tsjaa* by the Japanese; which was pronounced *tay*† in the lines of Pope, and is still pronounced so by the Irish; and which forms the common morning and evening beverage among us, from the stately duchess to the homely washerwoman.

This beloved tree of all ranks, belongs to the class Polyandria, and is of the order Monogynia, and is indigenous to China, and in all probability also to Japan. So immense is its consumption throughout the vast Chinese empire, that, in the opinion of Sir George Staunton, its price would not be materially lowered to the native consumer, even if the European trade were altogether given up.*

---

* Vide Appendix, p. xix.

† Vide Rape of the Lock, Canto Second.

Here thou, great Anna! whom three realms *obey*;
Dost sometimes counsel take—and sometimes *tea*.

Both the English and Dutch lay claim to the first introduction of tea into Europe; but common opinion hinges in favour of the claims of the latter, as according to the account usually given, it was introduced into England from Holland, in 1666, by Lords Arlington and Ossay. It was for some time esteemed a great luxury, and its price per pound was sixty shillings. Much opposition was made to its popular introduction, but without effect, as its use year after year became more extended, and, by the end of the seventeenth century, it was a generally known beverage throughout England. It is not a little curious, therefore, every thing considered, that as an article of commerce, the cultivation of tea should still be strictly confined to China and Japan, seeing, as Mr Graham observes, that many districts of India are beyond doubt "admirably adapted for the cultivation of the plant, and would richly repay the speculator, if proper stations were chosen for its growth."†

Any scheme for the successful cultivation of tea in Europe appears to us Utopian. Few of our climates are adapted for it; and even if they were, the expenses of its cultivation, and after preparation, would be so great, that its price would necessarily be much higher, if profit to the husbandman were taken into account, even than that imported from the East. Osbeck, in his voyage to China says, that "a workman who gains his livelihood there by plucking tea, will scarcely be able to earn more than a penny a-day, which is sufficient to provide for his miserable maintenance."

Since 1827, several attempts have been made at Java for the cultivation of tea, and from the Report of the Agricultural Committee of that country, it is supposed, with every prospect of success.

Although Linnæus has described two distinct species of tea, the green and the bohea, it is now pretty generally ascertained that there is in truth but one kind,—the two varieties being occasioned by soil and climate.

---

* Account of the Embassy to China.

† Means of Ameliorating India, p. 74.

The tea-tree is a branchy evergreen, from five to six feet in height; it has a ligneous and rather rigid stem, of an ashy colour, and more reddish towards the top; the branches, although alternate, shoot out irregularly. The leaves are elliptic, indented at top, and entire near the base; smooth, glossy, and shining, firm in texture, and of a bright green. The buds are enclosed in a husk, which drops off, and the flowers come out singly from the axillæ of the leaves. The calyx is small; the corolla has generally six white round petals; and the stamina exceed two hundred in number. The flowers are succeeded by capsules having three round cells opening longitudinally on one side only. The seeds are single and globose, about the size of a filbert. The kernel is oily, and is bitter and disagreeable to the taste.

According to Mr Barrow, the mean temperature of the Tea-country or Thekiang is, in the month of November, 56° Fahr. at sunrise, and 62° at noon. This particular tract of country ranges between twenty-eight and thirty-five degrees of north latitude, and is on the eastern side of China. In Japan no particular districts are devoted to its culture; but the trees are planted round the border of corn or rice fields, and the mode of cultivation is very much the same in both countries.

The tea-plant flourishes best on light stony ground; and the usual time for sowing the seed is in the month of February. It is placed in rows four or five feet asunder; and from six to twelve seeds are placed in the same hole. It is necessary to take this precaution of sowing so many, as from the oil in these seeds being apt to become rancid, a considerable proportion of them do not germinate. Careful weeding is necessary while the plants are very young. They are otherwise easily reared.

It requires three years, from the time of sowing the seed, before the first leaves become ready for gathering. They are then good and abundant. At the end of seven years the plant has attained its full height; but the leaves are then thinner, and less valuable, and it is customary to cut it over near the root. An exuberance of new shoots is thus produced, bearing leaves as strong, fresh, and plentiful as before. By this process the tea-trees are made to last an indefinite number of years.

The leaves are gathered either singly or in sprigs; and the average collection of a diligent day-worker varies from four to six pounds; but ten, and even fifteen pounds, have been collected by a single person in the course of one day.

Three crops are obtained in Japan during the course of the year. The first is gathered at the end of February, or beginning of March, while the leaves are yet very young. This is the finest and most highly valued produce, its use being confined to the opulent and luxurious; and it is called flower of tea, or imperial tea. The second crop is collected in April, and all the leaves, both the expanding and the expanded, are taken promiscuously; although they are afterwards separated and selected. The last crop is that of June, and is by far the most abundant, although the general quality is inferior, and the market price of a much lower description. The conclusion of this harvest is celebrated throughout the tea-country by a variety of rural festivals.

The tea-leaves are cured in buildings adapted for the purpose, having a variety of small furnaces, about three feet high, each having a large flat iron pan at top, which is thus heated to a certain degree. When warmed to that pitch that the hand cannot touch the metal without much pain, a few pounds of freshly gathered leaves are put into each pan. These crack when brought into contact with the heated vessel, and are stirred by the hand, as long as the heat can be suffered. The leaves are then removed from the pan in fan-shaped shovels, and placed on tables covered with straw-matting. They are then rolled together, by rubbing them with the hand, in a rapid yet regular manner; a yellowish juice meanwhile exuding, which causes a glowing heat. This operation of rolling, however, must be persisted in while the leaves are yet hot, as they will not retain the curl, if the operation is gone through with when they become too cool; and those that are imperfectly rolled together are then separated from the rest. This process of torrefying is repeated two or three times, according to the quality of the tea, before the process can be said to be completed, except in the case of the imperial tea, which is not rolled at all, but toasted to a greater degree, and then reduced to powder, in which case it is used.

Bohea tea derives its name from Vov-yee, the country where it grows. *Congo*, or cong-foo, which means great or much trouble in the gathering of the leaves, is, according to the account of Chow-qua, torrefied twice. *Pekoe*, or pe-how, signifying *white leaf*, is the produce of the tenderest of the trees of three years' growth, gathered just after they have bloomed. *Souchong*, or seou-chong, means *small good thing*, and is also produced from trees of three years' growth, on particular soils. When older, the same trees produce congo; but the tree souchong is exceedingly scarce.

It was at one time supposed that the green teas gained their colour by being torrefied on plates of copper; but according to Sir George Staunton, Kempfer, and other competent authorities, there is not the slightest foundation for the assertion, and it is now ascertained, that it is the frequent torrefication which imparts the green colour. In reference to the popular supposition, the late Dr Lettsom made many experiments on tea, but was never able to detect the presence of copper,—a circumstance which he could scarcely have failed to have done, had the minutest quantity been present, the volatile alkali being a test at once so decisive and delicate.

The leaves of the tea, before preparation, are said to possess an intoxicating quality, but that it loses this on exposure to the fire, and being kept afterwards for a twelvemonth. In consequence of this, the Chinese keep their teas for a year, before using. Supposing that the fact is recognised, the English teas must be completely dispossessed of this property, for besides the time of preparation, and transportation, the charter of the East India Company obliges them to have always a year's supply on hand, as a guarantee against very great fluctuations in the trade.

In 1835 the cultivation of the tea-plant was introduced into Hindostan, under the auspices of Dr Wallich, the secretary to the Agricultural Society of India. It had been previously ascertained, that many situations were adapted to its success, and parcels of the seeds, with proper directions, were sent to the various districts. It will of course require yet a little time, before we are enabled to speak confidently of the success of such an important experiment.

We pass now to the third and concluding section of this paper, which will be dedicated to indigo,—a production which has been known as belonging to India from our earliest intercourse with that immense region.

Under the name of *Indicum*, indigo has been mentioned by various ancient writers as a precious pigment; and Beckmann, in his "History of Inventions," informs us, that in the letters patent granted to the proprietors of the mines of Halbertstadt, it was classed among the *minerals*, for the preparation of which works were to be erected. Pliny, in his account of it, describes it as the exudation from a particular reed, mixed with mud, and Dioscorides considered it to be a stone. In ancient times, it was used solely as a pigment; and it was not, till the middle of the fifteenth century, that the Dutch imported it in sufficient quantities for the purposes of dyeing. For a long time a strong prejudice existed throughout Europe against its use in this way, as its colouring matter was supposed by some to be pernicious, and by others fugitive. These have, however, yielded to the hand of time, and its value is now universally appreciated.

There are several species of the *Indigofera;* but that which is most extensively cultivated in India is the *Indigofera tinctoria*, which is indigenous to that country. It is a small shrub, with a slender stalk, garnished with little branches, and growing to the height of two or three feet. It has a tap-root, which extends to an almost equal depth, and the stem becomes in time ligneous and brittle, with a greyish bark. Each leaf has four pair of oval winglets, terminated by an odd one; and they bear a pretty general resemblance in their softness and texture to Lucerne. These branches bear small flowers of a purple colour, somewhat like those of broom, succeeded by legumes, containing hard, brown, shining seeds. These legumes are about an inch in length.

The *Indigofera argentea* rises to a height of six feet, and its flowers are of a reddish or purplish green. Its seeds are black and shining. It is a hardier plant than the former, and is the kind cultivated in Barbary and Egypt.

The *Indigofera Americana* so much resembles this variety, that it is difficult to distinguish between them, except by the colour of the seeds; those of the last being of a reddish-brown. It produces less indigo than the *tinctoria*, but the dye is of a finer kind. This is the kind usually grown in Guatimala, but it has also been introduced into India.

" The indigo cultivation of Bengal," says Mr Ballard, " is confined chiefly to low alluvial tracts, without much regard to soil, nine-tenths probably of the land bearing this crop is more or less under water by the end of July."*

The crop is thus rendered very precarious, from the low sites which it occupies, and more especially when we consider the annual inundation, which occasionally happens at an unusually early period. It is this precariousness which makes the Ryott consider the indigo as quite a secondary article of production, and, therefore, he seldom or never appropriates his best land to its cultivation. He gives the soil for it scarcely any preparation, and scarcely any dressing is allotted to it during its growth. Indeed, his sole object for cultivating it at all, seems to be the advantage brought to him by a little ready money.

The apathy of the Ryott, or native farmer, has induced many manufacturers to betake themselves to the culture of the indigo; but this has been found an expensive plan, and profitable only in the most favourable seasons, because they cannot cultivate by any means so cheaply as the natives.

The periods of sowing the indigo plant are, first, immediately after the rains, from the middle to the end of October. At that time, the rivers are rapidly retiring, and when the soft deposite comes to such a consistency, that a man will sink

---

. Transactions of the Agricultural Society of India, vol. ii. p. 15.

no more than knee-deep in it, the seed is scattered broadcast; and this is continued, until the ground has become too hard for the seed to bury itself. The plough is then used, just to loosen the crust, and the sowings are continued till about the middle of November. These autumnal, are called October sowings, from the month in which they are commenced. Many of the plants perish during December and January, unless there be moderate showers, and still more in spring. The remaining crop is not so productive in the vat, as that from the spring sowings, and it is even thought that the quality is inferior.

The expense of the autumnal sowing is so much less than that of the spring, that it is adopted by most cultivators, the general risk of failure being so great, as to form a heavy discouragement to enterprize and outlay.

The second period of sowing is in spring, with the first rains of March. The land having been measured out, and having undergone its slight tillage during the three preceding months, the seed is scattered broadcast, as soon as the ground seems sufficiently moist, or even if there be strong indications of approaching rain.

The quantity of seed required for the autumnal, is generally more than that for the spring sowing. The quantity used in the former season being usually six seers per biggah, of Bengal, and four in the latter. The supply of seed is obtained from the western provinces, and forms a very considerable article of commerce.

It requires three months to bring the indigo plant to its highest state of perfection, for the purposes of manufacture. Sometimes, however, from the approach of the river, it becomes a matter of necessity to cut it down within half that time. Most indigo factories have therefore to commence in June, or early in July, at whatever time they may have effected their spring sowings, and their labours terminate about the end of August.

From ten to twelve bundles from each Bengal biggah is considered an average crop: the sheaf, or bundle, being measured by a six-foot cord or chain.

For a series of years, the necessity of being subjected to the native Hindoo husbandry rendered the produce very unproductive, as compared with other countries. Dr Tennant informs us,* that " the produce of an acre of tolerably productive land did not yield, upon an average, more than from six to ten pounds of indigo;" whereas, Dr Brown, in his " Natural History of Jamaica," says, that " four crops of indigo may be taken from the land in a year, and that in this manner an acre will sometimes yield five hundred pounds."

The Indian factories are in general on a very extensive scale, and large capital is embarked in them. The indigo of Madras, however, still continues an inferior article; but the factor of Bengal succeeds much better than the planter of America in producing an excellent article, although many of the more minute details of the preparation might undoubtedly be still very much improved upon.

In favourable seasons the indigo plants quickly spring up, and within a few days after sowing may be seen above the surface. It then becomes quite necessary to clear away the weeds, which would otherwise soon choke up and destroy the plants, which continue to thrive best in moist, rainy, or very cloudy weather. But although this be the case, sunshine is indispensably necessary for the perfection of the colouring-matter, it being found, by analysis, to contain a great proportion of carbon, which it cannot accumulate without the direct operation of the rays of the sun. When the plant becomes nearly matured, a sudden change takes place in its colour, from light to dark green. Three or four months after sowing, the plants bloom—a time most favourable for the first cutting, and this is done by means of a sickle, a few inches above the root. The *rattoons*, or shoots of a subsequent growth, afford another cutting in a few weeks, after which the plants lose their vigour, rendering the yearly sowing quite an indispensable matter.

After the first cutting, some of the best plants are left for seed which remain untouched, until matured in the seed-vessel. Mr Porter informs us, that " ten bushels of these legumes generally yield only a single bushel of clean, dry seed fit for sowing."

---

* Indian Recreations, vol. ii.

After all, the indigo is one of the most precarious of all the crops of a tropical climate. It is subject to the depredations of an insect, whose insatiable voracity often blasts all the hopes of the cultivator; and if planted the second year on the same soil, it seldom escapes.

We may here add, that indigo obtained from the plants before flowering, is said to be of a finer colour, although the quantity be much less. Nor can it be said, that the additional money acquired is an adequate compensation in a mercantile point of view. It is only therefore, under particular circumstances, that the process is resorted to.

That part of the indigo from which the colouring-matter is obtained, is the feculent pulp separated from the leaves, and in this it principally or almost entirely resides.

The following directions for the manufacture of indigo are, in a great measure, abbreviated from the paper read before the Agricultural Society of India, 10th June 1829, by H. Piddington, Esq.

Cutting the Plant.—Stalks will reproduce shoots, but they give no indigo. Care should therefore be taken that the plant be cut over where the yellow leaves begin. The more stalks left, the more buds, shoots, &c. for a second, or even third cutting.

When cut, the plant should be kept clean, and in the shade, as heating is thus prevented. When the plants must be conveyed to a distance, cylinders should be put in the centre of each bundle, to preserve ventilation, and so prevent heating.

Stowing.—It should be observed from what side the water comes into the vat; and if from one side only, the plants should be stowed on that side, as they begin to heat on that on which you begin to stow, before the other is finished. The coolness of the water causes an equal diffusion of the heat. Stowing *up and down*, as it is called, is the best method; one row of plants being set with their stalks in the natural position, and the next row with the stalks reverted. By this means, the top and bottom of the vat are mostly stalks, and the middle leaves.

In very warm or close weather, little or no pressing is required, the beams merely being laid down over the plants, and bolted; but in cold weather, it is necessary that the vat should be well pressed. Covering the vats with mats is of advantage, as it both advances the fermentation, and saves time.

Fermentation.—The period necessary for fermentation, and the appearances it puts on, are so variable, that no particular rules can be laid down. For instance, should rain occur, the time of fermenting will vary from nine to eighteen hours. When the froth begins to break,—when large dull looking bubbles appear amongst it,—when the liquid taken from the bottom has an oily appearance,—and when the smell, which is not disagreeable, begins faintly to indicate putridity in any part of the vat, then it is time to let it off. It is useful to note the colour of the liquid, at the moment the plug is withdrawn. The first burst should be of a bright orange colour; if it be reddish, then the vat has been over-fermented; if only yellow, too little so. In running off a well-fermented vat, the smell much resembles that of stale ham.

Beating.—Men are set to walk about in the vat, as soon as the plug is taken out. At first that motion is preferable, which makes the fluid fluctuate to and fro; but latterly that which causes it to be driven towards the centre, and this is done by the people treading round in a circle. Two or three hours are generally necessary for this process. If less, the indigo may be finer in quality, but the produce much smaller. When vats are over-beaten, the produce is generally hard.

The common test, however, of beating, is the use of the plate. No attention need be paid till the vat is of a dark purple, or rather black colour, and the first froth is all beaten down. What froth is now observable, will be of a dazzling white and in fine bubbles. If the liquid be now taken up in the plate, it will settle, but the fecula will lie in black flakes, and the water of a pale yellow. In continuing the beating, the liquid will no longer settle in flakes, but in grains, more or less coarse, and the water becomes of a golden colour, while the froth is of a cream tinge. When the beating is stopped, the vat should immediately lose all its froth, and become of a clear chocolate-brown, with clouds of blue.

Settling.—The beating being over, celerity in the after process is of the utmost importance, as the best produce may be spoiled between the beater and the go-down, if there be delay. As soon, therefore, as the vat has settled, which takes place in two or three hours, the liquor should be let off as fast as possible. The waste, or *pocha* water thus let off, should be from a light to a dark Madeira colour; and although some believe that in proportion as it darkens, over-fermentation is indicated, it is much more likely that this circumstance is attributable to the proportion of stalks to leaves. When the waters are green, or dark coloured, they indicate their holding indigo in solution, and consequently a loss of produce.

The fecula should be now got from the vats, into the mixing cistern, as fast as possible, and it should also be filtered in this process. The way of accomplishing this, is by means of a box full of holes, at the bottom of which a network framing of bamboo is placed, over which is fitted strainers, the one of fine bafta, the other of flannel. If the box be not large, this is a slow operation, but it is an important one, in freeing the indigo from dirt and sand. The fecula should also be pumped upon a filter, placed over the copper, and again in passing from the boiler to the draining-table.

The process of *boiling* next commences, and it should be done *quamprimum*, for here delay is indeed dangerous. The fecula should be pumped into the copper, where water has been previously kept boiling, and the boiling should continue, with plenty of water, until the matter exhales *an agreeable sugary smell*, instead of the sickly one, at first given out. The boiling should go on from three to four or five hours. Should there be too little fecula to permit of this, three times its quantity of clear water may from time to time be added.

Filtering now succeeds, and being necessarily a slow process, should be expedited by all possible means; and the syphon, and what has been called by Mr Piddington, "the decanting-frame," have been used with great advantage. When the fecula is settled on the table, a syphon of lead pipe, of a small bore, will draw off the fluid from the top, to within three or four inches of the fecula, without disturbing it, if carefully managed, by hanging the syphon to a beam with a string. When this is done, if a stout wooden frame has been placed under the bamboo network, on which the cloth lies, it may be gradually raised at one end, so as to throw all the liquid gradually to the other, where the syphon will again draw off the whole.

If proper management be adopted, the fecula may be put into the boxes while yet warm. These boxes should be made double, and a small frame should be placed on the top of the large one, to be taken off when the cake is half pressed down. The custom of using only one frame, and adding fresh fecula to bring the cake to its thickness, is very bad, and unnecessarily wastes time. The holes of the frames should be numerous, and constantly cleaned, by having a stout wire passed through them. By this means the pressure is expedited, and the cakes saved from fracture. The time of pressing should not exceed seven or eight hours. In cutting the cakes, it is necessary that they should have acquired such a consistence as not to yield to the pressure of the fingers.

In cutting, it should be observed, that if a cake breaks, the wetting it lightly immediately, and pressing the pieces together, will generally be found sufficient to make them adhere; for if broken up entirely to press them again, the cake will be found deficient in colour. The cakes should now be carried from the apartment on trays covered with cloth, and allowed to remain on them for three or four days. They are then to be placed on the stages, with at least their own bulk of interval between them. If the cakes preserve their sugary smell for three or four days, it is a proof that they have been sufficiently boiled. It is of importance that the apartment to which the cakes are carried should be well lighted, for in the absence of sufficient light, the minute fungi, which give the fine white coat to indigo, do not grow so well.

In cleaning the cakes when dried, very soft brushes are used. Hard ones take off the white coat, which adds greatly to its appearance.

In concluding these brief observations on the cultivation and manufacture of indigo, we may remark that the modes of these are very different from what was practised by the natives of Hindostan. English enterprise has established a trade in this drug, which from its extent and value has made it a prominent item in British commerce. The value of indigo to our Indian possessions is immense. Its cultivation covers a space of ground not less than 12,000 acres, and gives subsistence to 500,000 families. About two millions of money are invested in factories and stock, and there is an annual outlay of L.1,600,000 in connection with it. Add to this, that it has occupied large tracts of land, which lying within the annual inundation of the Ganges, was unfit for any native cultivation, and has raised the value of lands, at least one hundred per cent., in the various districts where it is raised.*

In a paper in the Indian Transactions, Mr Alexander well says :—" There is no speculation on which the opinions of men in England, supposed to be conversant with the subject, more widely differ, than that of the cultivation of indigo, in Bengal. By some it is considered the safest investment of mercantile capital; by others, it is contended, that we are fast approaching the point where production will exceed consumption, and that then the speculation will be an unprofitable one. Those who entertain this latter view of the speculation assert, that we possess the means of unlimited cultivation of indigo in this country (India); and that we are annually increasing the quantity of our crops. The object of this paper is to investigate the truth of this opinion, and to endeavour to shew the actual state of the indigo trade of this country, and how far the increased production is met by an increased consumption; for it is obvious, that if causes exist, which restrain the cultivation of indigo, and that the average increase of production is equalled by a like increase of consumption, the speculation is in an equally flourishing state, whether the average crop be one hundred, or five hundred thousand maunds."

Mr Graham, in his " Means of ameliorating India," makes the observation, that " indigo has been tried on the west side of India, in Guzerat, and has been found to succeed very well. There seems to be no reason why it should not be raised to the same extent, and of equal quality, to that produced by Bengal." †

The value of indigo at present annually exported from Bengal to Europe is estimated at from two to three millions sterling. The average quantity is said to be about 120,000 maunds, or 9,000,000 lbs.

It is thought, that there are from three to four hundred factories established throughout the Bengal provinces; and that in addition, there are a great many small establishments conducted by natives, who have acquired some knowledge of the European mode of manufacture.

---

* Transactions of the Agricultural Society, vol. ii. p. 31-2.

† Page 69.

From Mr Richardson Porter's very valuable work, we learn, that the quantities of indigo imported to England, exported from it, and retained for home consumption, are as follows, from 1827 to 1831 inclusive.

	1827.	1828.	1829.	1830.	1831.
	lb.	lb.	lb.	lb.	lb.
Imported............	6,067,747	9,913,010	6,748,281	8,216,440	7,307,313
Exported............	3,085,465	4,588,658	4,286,605	4,636,748	4,374,241
Cleared for consumption......	2,396,490	3,064,915	2,113,830	2,676,945	2,490,134

The vicissitudes attendant on the cultivation of indigo are so great, that the fluctuations are a great damp to continued enterprise, and must ever render the prosperity of those engaged in it a matter of uncertainty and doubt. Mr Tennant, in reference to this subject observes, that "a planter, whose crops to-day are rich and abundant, whose expectations of a profitable return seem perfectly secure and reasonable, may awaken to-morrow to behold all his hopes completely blasted,—a storm of wind, accompanied by rain and large hailstones, as completely ruins his crop as if it had been devoured by the locusts. From this latter calamity the indigo planter is not exempt in any part of Bengal."*

Our next paper on the Agriculture of India, will be principally devoted to the curious and important subject of the cultivation of the production of silk, and its manufacture. Perhaps we may conclude the series with that paper, as hinted by us at the commencement of this; but being uncertain to what length that particular subject may carry us, we must be entirely guided by the space which may be left or allotted to this branch of our agricultural speculations.

---

* Indian Recreations, vol. ii. p. 150.

THE CULTURE OF THE POTATO.

By Mr Towers, C.M.H.S.

" The subject of the potato culture is yet quite open to the experimenter. Experiment on it by all possible varieties of ways is our advice; and when a sufficiency of facts have been collected, we shall then, but not till then, be warranted in theorizing on the nature of the potato plant." It is neither loss of time, nor useless repetition, to copy verbatim the closing paragraph of the editorial note, p. 110 of the last number 41; for, by so doing, attention may be rivetted to a very grave subject, and also to the other papers, in the same number, to which the note refers.

Considering the admonition to experimentize in all possible varieties of ways as most sound advice, I believe that I shall be acting in accordance with it, by entering into a detail of the various methods of culture which I have pursued during a period of eight or more years, and noting down, as far as existing documents permit, the corresponding results. I will premise that, previous to 1830, my practice was regulated by that of ordinary cultivators in the west of Wiltshire, where I then resided; but that subsequently, in consequence of the frequent intercourse by letters with the venerable (late) President of the London Horticultural Society, and of receiving numerous varieties of potato from that gentleman, the product of his own unremitting experiments, I altered my practice, and have met with great success. At the period when the public press was burdened with alarming notices of "failure," I never saw an unhealthy plant, with one most singular exception, which I will, in its place, adduce as such. If this article fail to announce, or give weight to any new and important facts, it will, at the least, offer a pledge of what has been, and may again be successfully attempted. The opinions and theory of the lamented president shall be referred to, and thus the reader will be placed in possession of some valuable extracts from original letters, which are by me esteemed very precious relics, for they are now all that remain of one of the most candid, liberal, unselfish minds that ever adorned the world of science.

In the cultivation of the potato, the chief object ought to be the production of the utmost quantity of that mealy substance which constitutes the nutritive property of the root. This substance was formerly called the *farina*, a term which, if referred to qualities resembling those of meal or *flour*, can by no means be admitted, because of the total absence of that peculiar *gluten* which distinguishes the flour of grain, and qualifies it to undergo the panary fermentation, and become bread. *Amylum* and starch, on the contrary, are correct terms; and with this remarkable substance the potato abounds, but to a greater or less extent, according to the ground in which it grows, and to the routine of culture to which it is subjected.

By the analysis of Einhoff, referred to by Sir H. Davy, in his Agricultural Lectures, the following results were obtained:—

From 7680 parts of potato—	
Of starch (*amylum*)	1153
Fibrous matter, analogous to starch	540
Albumen	107
Mucilage, in a state of saturated solution	312
	2112
Residue, or loss, must have been worthless fluid =	5568

Thus the starch, to the extent of about 1700 parts in 7680, constitutes the chief material of food, because the mucilage in solution, represents only just so much gum-water, and the *vegetable* albumen can hardly be admitted to be equal to a like quantity of the "white of egg," *animal albumen.*

My own more simple and familiar analysis, described in the "Domestic Gardener's Manual," under the article "*The Potato*," gives, from eight pounds of washed, but unpeeled potatoes finely rasped,—

	lb.	oz.
Of amylum or starch	1	6
Of pulp, after pressure by hand	1	11
Loss in water, or soluble matters	4	15

The amylum, whether it exist in the state of powder, or in the form of "*fibrous matter*," is the substance which confers excellence upon the vegetable. Potatoes will grow in any soil, from that of the loosest sand, if it be united with some reduced vegetable matters, to the strongest clays of agriculture; but what is of still greater moment to the subject under consideration,—the produce in amount or quality appears to be materially influenced by local agencies, even in soils of the same constitution. Thus the sands which bring fine mealy tubers in Somersetshire, fail in other quarters of the kingdom. On this ground only can we account for the discrepancy which we meet with in the papers of the many cultivators who have given publicity to their practice and opinions; one asserting that the light and dry lands bear the best crops, while another maintains, that stiff and clayey soils are most congenial. The operations of soils, therefore, are contingent; and it is proved, almost to a demonstration, that potatoes which are excellent in West Wiltshire, as for example, the varieties there termed the "Early Purple-eyed," and the "Prince's Beauty," became deteriorated in Berkshire, treat them how you may. Lancashire is famed for its varieties, which boil to a meal that crumbles under the fork, and is nearly as white as flour, but the varieties change in the Midland and Southern counties. That soil, and routine of culture, which produces the strongest haulm, and most expansive system of foliage, will yield the greatest bulk of tubers; hence the opinion which we constantly hear expressed, "*that the potatoes run away into haulm*," is a fallacy, because experience proves, what physiology teaches, that the tuber is the product of the foliage, by the quality and breadth of which its comparative substance is regulated. But experience and facts also demonstrate, that when the foliage is rendered too massive, and the stems become too high, and therefore unable to support the weight of a luxuriantly rank herbage, the tubers, though large in size, numerous, and weighty, are poor in quality, deficient of amylum, and frequently hollow. A *medium growth*, wherein the balance of strength is supported between the stem and leaves, is the result of a well prepared and healthy soil, reciprocating with the stimulus of the sun's rays, and the decomposing agencies of atmospheric air, and of water.

Such a soil will yield sound tubers, be it sandy, light, and easily pulverizable, or unctuous, and adhesive. And on these grounds, quality, *firmness* of texture, and *mealiness*, ought to be the standard, rather than weight of tuber. Thus, in the west, we find the return from the seed sown in the sands, however sound and excellent it may be, is still little more than half what may be, and is produced in the rich loams of Berkshire. In the latter, I have been told, of 700 bushels, of 60 lb. each from the statute acre; whereas I have seen little more than from half to three-fourths of a bushel, digged up from the rod or perch, in the grey sands of Wilts, which is in the proportion of little more than 100 bushels per acre. Mr Knight has calculated that 1000 bushels, imperial measure, each weighing 80 lb., may be produced; and experiment goes far to shew what *can* be effected. Nevertheless, take one county with another, the utmost average might perhaps be rated at 300 bushels of ordinary weight, four bushels to the sack. To conclude this view of the old treatment, and its results, it will be only needful to state, that potatoes of the smallest medium size, were cut into sets, each containing from one to three eyes,—the rose, or crown ends, being frequently rejected; the sets were then suffered to become dry under a shed; the starch setting and coating the wounded surfaces, and the texture becoming soft and flaccid, in consequence of the emptying of the cellular tissue by evaporation. Could robust growth, or large healthy produce, be reasonably expected to result from treatment so diametrically opposite to sound philosophy? *Disease*, however, is not now contemplated,—*that*, perhaps, was purely local and epidemic; but it were as rational to expect vigour and strength, by the operation of agents purely debilitating, as to hope for great bulk and prolificity, from mangled fragments of tubers, rendered inert by exhaustion.

My correspondence with Mr Knight, upon the subject of potato-culture, commenced in 1831. A letter, dated 4th February of that year, is now before me, and from it I extract the following connected particulars entire. These, I imagine, will now prove a source of valuable information to others, as they did to me, at the time when I derived the first correct knowledge of that improved culture, which must finally, if it be duly appreciated, supersede the old and faulty routine.

> "I obtained," said Mr Knight, "from the *ash-leaved kidney*, last season (a bad one), a produce equal to 670 bushels, of 80 lb. each, per statute acre; and I entertain no doubt of having as many this year. To obtain these vast crops of the ash-leaved kidney, I always plant them *whole*, selecting *the largest* I can raise, and from *very early crops:* those ripened early in the preceding summer are kept dry. I usually plant them upon their *ends*, to stand with the *crown end* upwards, and place them at four inches distance from centre to centre in the rows, and the rows two feet apart, and always pointing from north to south. I plant my large potatoes much in the same way, but with wide intervals, according to the height which the stems acquire.
>
> "Thus I plant 'Lankman's' potato" (a noted variety, then, I believe, the subject of experiment), "which grows a yard high, at six inches distance from centre to centre, and three feet six inches, or four feet between the rows; *never cutting any potato*, nor planting one of less weight than a *quarter*, but generally *half a pound*. By using such large sets, I get very strong, and large plants, with widely extended roots, early in the summer; and I begin working, as it were, with a *four-horse*, instead of a one-horse power. I do not despair of getting 800 bushels of potatoes from an acre of ground, if I live long enough to see the produce of some new varieties, which I have formed, and which are of very vigorous growth, whilst they do not expend any thing in blossoms. The *blossoms take away a good deal of sap*, which may be better employed in forming potatoes; and whenever a potato affords seeds freely, I think it almost an insuperable objection to it. As a general rule, I think potatoes ought to be planted in rows distant from each other in proportion to the height of the stems; the height of the stems being full three feet, the rows ought to be four feet apart, and the sets (tubers) of the *very largest varieties* planted *whole*, never to be more distant from centre to centre than six inches. By such mode of planting, the greatest quantity of leaf (the organ in *which alone* the vital nutritive fluid is made) is exposed to the light. I have this year obtained many seeds of the ash-leaved kidney potato, crossed with another early variety, from which I expect some valuable early varieties, though I scarcely hope to get any thing preferable to the ash-leaved, *if that would not wear out.*"

The foregoing passage may, I conceive, be regarded as a compendium of philosophical culture. The extract which follows, is from a letter dated 5th July in the same year; it contains interesting observations on the means to accelerate or retard a crop of potatoes. Speaking of the earliest variety, Mr Knight observed—"The tubers which have ripened early in one season, are alone proper to plant for a very early crop; those which have ripened *late*, being not sufficiently *excitable*, though more eligible for a late, or rather a moderately early crop, the produce of which will be proper to plant for a very early crop. By attending to these circumstances, and by planting tubers large enough, and near enough in the row, with proper intervals between, according to the height to be attained by the stems, you will be able to obtain much larger crops per acre, than are usually obtained."

As respects the age or condition of seed-tubers, Mr Knight says—"Potatoes somewhat immature, are quite as good for planting in the following year, as others; and in some cases, perhaps in many, better: for, a particular disease, formerly well known under the name of '*curl*,' appeared on plants raised from mature tubers, and not from those raised from immature tubers."

During the years 1830–1–2, Mr Knight had raised, by cross impregnation, a great many varieties, fourteen or fifteen of which he sent to me, as specimens: they all possessed the characteristic mark of excellence, which it was the object of the originator to attain,—that of *developing no perfect flowers;* the flower-stalk would rise with its germs of blossom, but these would suddenly become yellow, and fall off, without expanding, consequently the plant had all its energies devoted to the subterranean expansions. Of the enormous yield of several of these varieties, I hold by me the written proofs. One which was numbered 4, Mr Knight states to have produced 23 cwt. 1 qr. 76 lb. per acre!

With these, and other facts before me, it was natural that a course of experiments should be immediately instituted; and these have been persisted in, with some modifications, to the present day. My practice, therefore, differs from that of every ordinary cultivator, and its results, which will now be stated, cannot be reckoned unsatisfactory. I have not, however, adhered rigidly to the system of Mr Knight, in planting entire tubers, because it sometimes required more seed-stock than could at all times be conveniently spared. But there are cases which require certain modes of practice, and these ought to be clearly understood by those who cultivate several varieties. A few lines will render this sufficiently clear.

Every county has its own peculiar favourites; and local names are applied, which make it difficult to identify varieties. All persons, in England at least, appear to understand and appreciate the qualities of the early *ash-leaved kidney po-*

tato, and therefore I assume it as a standard for the treatment of varieties intended for the earliest summer supply of the table, rejecting as irrelevant to the present inquiry, any reference to artificial excitement, either by frames and glasses, or by warm beds of fermenting materials.

The growth of every plant must imply the production of heat, and of this heat there are ample sources to be found in the decomposition of water, and vegetable or animal matter in the ground, by the agency of that enormous volume of the electric elementary fluid, which holds the constituents of those substances in a state of natural union. In planting the ash-leaved kidney, it is my practice to provide for early development, and ample security from spring frost, by digging trenches six or eight inches deep, and nearly a foot wide, throwing the earth in the form of a ridge on either side of the trenches. Into the soil, at the bottom of each trench, three or four inches of half decomposed stable manure, with leaves, used for linings, are digged, and then a little light earth, if required, is raked in, sufficient to leave the surface, when settled, about four inches below the level of the ground. The ash-leaved potato has very few eyes, therefore it is desirable never to cut it into sets; the potato is pressed into the soil, upright, the eyes being uppermost, and the potatoes standing five inches asunder, according to the directions by Mr Knight. Earth from the ridges is drawn over the crowns, to the depth of an inch, and occasionally half an inch of sifted ashes, or of light linings' manure is superposed, thus making the first covering an inch and a half deep.

It is the usual method to place the potatoes, or sets, four or five inches below the surface of level beds, and when the shoots appear, to draw earth to the stems. But by the trench-planting, which may be performed in March, or even earlier, the crowns and advancing buds are quite sufficiently protected from the frost, unless it happen to be of very severe character, and then an inch or two of light litter may be laid in the trenches. The great mischief, however, which befals the earliest plots, is occasioned by frosts in May. Now, the trenches afford protection to the tubers, while under ground, and as soon as the shoots are seen above the surface, fine earth is raked or hoed from the ridges, so as to cover the first developments. As the shoots advance again, more earth is drawn down, till at length, the trenches being filled, the level of the surface is again produced, and with it a sufficient and ample depth of earth is afforded to the tubers, and their fibrous processes. All then that remains to be done, is to dig the ground between the rows, to the depth of three inches, sufficiently to give freedom, and openness of texture. I am averse from ridging and earthing-up, as I can see no utility in it, and never once found an additional potato from its adoption. I have seen whole ranks of potatoes blackened by the frost of an hour or two; and even in the present season, have been told that great destruction was produced by the frost of the 16th of May. My thermometers gave proofs of at least six degrees, but the potatoes remained safe; and if any persons be inclined to cavil against the practice recommended, I can only, in self-defence observe, that frost has never hurt me;—my potatoes have lost no shoots, have run their course uninterruptedly, and have evinced neither failure nor disease.

In 1836. March 16. to 19.—Four rows were planted, in trenches between single asparagus rows, and about eight feet asunder; they yielded 72½ lb., from 12¾ lb. of seed-tubers.

In 1837. March 3. to 7.—Twelve pounds were set in a single trench, twenty-four yards long—abreast, and four feet in advance of a wall, with an aspect south by east. From this row were digged 72 lb., of excellent flavour. In planting this variety, I have never been very particular as to the direction of the rows, but have placed them widely asunder. The yield has rarely exceeded six times the weight of the seed. There are so few eyes in this potato, that extensive herbage cannot be expected. Indeed, on some occasions, blanks were observed; yet a progeny of potatoes was found to have been produced, without the protrusion of any superficial herbage. It is, however, of great moment to protect the foliage from frost, as soon as it becomes visible, because a shoot lost cannot so readily be re-supplied, as it is by other varities, prolific in eyes. I am aware that I have trespassed considerably upon the time of the reader, on a subject not strictly connected with the farm; yet it appeared essential not to overlook the garden varieties, in an article which is designed to furnish a standard of comparison. I pass, however, to the store varieties, without further remark.

Winter Potatoes.—Such are all that are not digged for use till after Michaelmas, and of these every county, nay almost every parish, has its own peculiar favourite. Some, however, are in prime condition before, and two months subsequent to Christmas, while others ought not to be cooked till April. I lately cultivated a round potato, which bore the title of Cornish rough-red. It was hard as a cricket-ball, and almost as round, and never started an eye till June, while it remained out of the soil. The pushing of the eyes affords a pretty correct guide as respects the time when a potato is in season, and when it ought to be planted. If during the winter, the tubers be kept in a dry cave or pit, where the utmost degree of equable cold can be maintained, consistent with the exclusion of actual frost, the quality and flavour will remain more pure than when they are covered by any moist or fermentable material whatsoever. If, under this simple, unexciting treatment, any variety protrude its eyes, that variety is not *a keeper.* This is the only complaint which can be advanced against that truly excellent, and widely cultivated potato—

The Early Shaw.—Its skin (*testa*) is of pale buff, covered with a rough, russety membrane, and herein it differs from the *Champion.* Both of these capital varieties possess the defect or vice of blossoming and fruiting copiously; yet they are too finely-flavoured to be rejected. In all countries there are *kidneys,*—red, white, or mottled, which possess qualities adapted to soil and atmosphere; but with the exception of Mr Knight's crossed seedlings (of which the *Downton Yam* is a fine specimen), I know of none that cast the blossom-buds ere the flowers expand.

All these medium and long keepers are furnished with a number of eyes, distributed over the greater part of the surface, yet abounding most at that end which is opposite to the point where the organic process, or funis entered, which supplied the tuber with nutriment derived from the parent stem. The end where the eyes are chiefly congregated, is termed the rose, or crown, while that which was connected with the parent, is termed the root-end. Many persons reject the former, believing that it produces too much haulm. But the fact is, that as in the shoot of a tree, if one or two good buds break, they push on, leaving the inferior buds silent and unexcited. Thus, rejecting the root end, it is advantageous to cut a large potato that abounds with eyes, into sets, to comprise not fewer than *two*, nor more than *three* eyes; and in cutting, to distribute the crown eyes fairly, as may be, among other eyes situated below them, by making the cuts in a diagonal direction. I know, by experience, that Mr Knight acted upon sound and secure principles, when he recommended the planting of entire tubers, because he knew well that an ample yield might be assured, one or more of the eyes of each being certain to break. Moreover, in the event of that shoot or shoots being cut off by frost, other eyes, till then inactive, would be ready to produce successional shoots.

Two facts of importance in physiology, now present themselves to our notice: *First*, All the eyes of entire potatoes do not push at one time, therefore it is a mistake to suppose, that a plot becomes crowded by useless haulm, if the potatoes be planted whole. *Again*, persons have imagined, that weakness of the root is occasioned by the destructive action of frost upon the earliest shoots; this also is a mistaken notion, for, if any eyes remain unexcited in the tuber under ground, the loss of one shoot is speedily supplied by the substitution of another. Time indeed may, to a certain extent, be sacrificed, but that is all. Of this any one may convince *himself*, by endeavouring to exterminate a straggling potato; he may hoe, or pull off the first shoots, and think his ground cleared of the intruder; but in a week or two, the spot will be again occupied, and it will be perceived, that nothing short of the complete removal of the tuber can prove effectual. If *sets*, with one or two eyes, have been planted, and have sent up all their shoots, then the destruction by frost may prove fatal; but it may happen, that a shoot shall appear to be killed to the ground, and yet produce a fruitful plant, though late in the season, from embryo eyes seated around the stem, near its point of emersion from the potato.

Since it appears a demonstrable fact, that *whole potatoes* rarely *develop* all their eyes, it becomes a question of economy, whether it be not better to plant *cut sets* of the keeping varieties. Many persons cannot spare a large stock for seed; and in that case, it will be prudent to employ sets, with two or three eyes, taking especial precaution to guard the plants from late frosts, and promoting the utmost activity of vegetation, by a wise system of culture; the general principles of which are found in the extracts before given, from the letters of Mr Knight.

These principles refer chiefly to the influence of *light upon* the foliage, and it certainly is a fact, that by making the rows in the direction of north and south, the sun at mid-day shines along the entire line, exerting his greatest power of attraction, in a way which tends to retain the upright position of the haulm. But there are other considerations which refer to *soil* and *nutriment*, and these must be always kept in sight.

The texture of the soil should be naturally free, if possible; but as the desirable medium is not always at command, it will be prudent to set up heavy land in ridges, during the autumn, to expose a great surface to the frost. The manure required should be introduced at the same time, with a quantity of sea-coal ashes, if obtainable. Sand, even in excess, will frequently fail to meliorate heavy, binding earth; but ashes, which contain a large proportion of finely divided silex, some red oxide of iron, and a little alkali, produce the happiest effects. In alluding to this autumnal preparation, I have a double object in view, dependent upon the habits of the potato. The plant affects a light and moderately enriched soil, wherein its fibrous roots, and tuber-bearing processes may wander laterally, but not deeply; therefore, whether the plough or spade be used, the manure ought to be blended with the earth prior to its being thrown into ridges, that the whole mass may be mellowed by the winter's exposure. Six inches of well laborated earth, over a more solid subsoil, is amply sufficient for the play of the roots, consequently, the ridges ought to be raised to the height of twelve inches. After the winter, the soil cannot be too much broken down, nor the manure too intimately incorporated with it; but for these purposes a dry season should be chosen, otherwise the labour of the previous operations will be thrown away, and the main object defeated. I believe that the quality of potatoes is much injured by strong recent manure. Autumnal preparation effects every purpose; the manure is laborated, but not dispersed; it loses rankness, but is brought to the condition of what is fancifully called *humus*, a hydro-carbonous substance, brought to a condition which fits it to supply vegetable aliment when exposed to the decomposing stimulus of the vital principle. *Sands*, however, ought not to be raised into ridges; they decompose manures rapidly, and whatever organic substances are applied to them in autumn, should be placed some inches below the surface. It has been shrewdly conjectured, that the straw to be converted to manure ought, as far as is possible, to be brought from land of an opposite quality: thus, if it be intended to meliorate a poor and sandy earth, the farmer should endeavour to obtain his straw from situations where the staple is a strong or clayey loam. Facts are wanting to establish the implied theory, but it merits investigation.

It was customary, as before observed, to keep the sets till much of the moisture had evaporated, and the substance became flaccid; this drying is perfectly needless, and may prove detrimental. It has been a regular practice with me to plant as wanted, fresh from the knife, row by row; and in order to absorb the moisture which exudes from the divided cellular substance, and at the same time to prevent the attacks of grubs, and subterraneous vermin, the set has frequently been dipped into powdered lime, fine ashes, plaster of Paris (gypsum), as conveniently at hand. The lime has been recommended, and certainly no mischief of any kind has resulted from the practice. My potatoes, in garden or field, have always done well, excepting, as I stated, in one solitary instance, of which the following is a faithful narrative.

A few potatoes, with a dark mulberry-coloured skin, but extremely white pulp, were planted, as a trial. From two or three, a number was raised sufficient to plant one row, in the spring of 1835. On the same bed, and not four feet distant, another variety was set, at the same time, and in the same way. The plants of both rose without failure; but when the purples had attained the height of six inches, the foliage lost the healthy hue; it first changed to a purplish-green, then faded off to a sickly yellow. The ground was hoed, lightened by the spade, and every common means was resorted to, but vegetation could not be stimulated—the plants died; and at the season of digging, not a vestige of a potato remained,—the destruction was total. As every other variety remained healthy, and yielded fairly, and as the soil appeared in good condition throughout the season, no one existing or traceable circumstance tended in any degree to elucidate the mystery."

I have never seen nor heard of that variety since; and it is just possible, on the theory of Mr Knight, that its term of life was come, and *extinction* the consequence.

Entire potatoes were used by me during two or three seasons subsequent to the receipt of Mr Knight's specimens, and I selected tubers, of the average weight of *four* ounces, always placing them upright, and regulating the rows, and the distances between the tubers, by the ordinary height of the haulm. As the stems advanced, earth was drawn against them, till at length it formed complete ridges, a foot high on the two sides. Good crops invariably resulted from powerful and healthy growth; but the yield never corresponded with the great bulk of seed-tubers planted, for it averaged about a six-fold proportionate increase. Thus, if 8 lb. were set in a row five yards long, the crop produced would weigh about 48 lb. In 1835 I adopted the practice of planting sets, with the exception of those varieties, early or medium, which are naturally furnished with but few eyes, situated about the crown. I found the yield to be quite equal to that obtained from entire tubers, so that the weight saved was strictly an economy of seed-stock. I believe this remark may be applied even to ash-leaved kidneys, wherein the lower, or root-ends, have very seldom any good eyes; and that of the rose-ends, with an inch of the pulp of the potato below, were cut as sets, two-thirds of the substance of tubers might be saved for the table; but the experiment remains to be tried. From the annexed statement of the plantings and proceeds of 1837, some opinion, however, may be formed on the subject; and if ash-leaved potatoes can thus be economized, a considerable saving of expense will be effected, as the dealers sometimes demand ten or twelve shillings per bushel (often not weighing above 52 lb.) for seed potatoes.

Experiments of 1837.

1. A long, *medium-early potato,* a variety of kidney, which assumes curious twists, and curvings. The tubers become very large occasionally, but appear to be always of superior quality. This potato is good at any season, from the time of digging, in September, to June following. There were planted, in trenches, 26 lb. of whole potatoes.

12 lb. in the garden, between March 30. and April 5.
14 lb. in an orchard plot, April 6. to 8.

The total yield from these 26 lb. was 354 lb.

2. In the orchard, at different dates, between April 8. and 24.—

Early Shaws, chiefly cut sets of 4 oz. tubers, two and three eyes, limed; a few 2 oz. whole tubers, were used separately—total 30 lb.

The crop was digged, November 6.—weighed 520 lb.

3. *Downton Yams.*—(Knight's). The seed from three or four years succession, in my own garden, or field. Cut into two and three eyed sets, 22 lb. 12 oz.

The crop digged at the same period as the shaws—215 lb.

4. *Early Champions.*—Their first crop, being an exchange with a person whose soil is extremely different from mine. Sets cut by division of the tubers from the crown to root end, picking out the central eye, and after liming, laying the cut sides downward, so that the broad surface of eyes lay uppermost.

Sown April 20. 13 lb.—Yield in November, 150 lb.

5. *A reddish-brown,* white *mealed-kidney,* which I have reason to believe was originally brought from Wales, by the late Pascoe Greenfell, Esq., new to me at this planting; received from a distance. The eyes are numerous, and pretty equally distributed; therefore the potatoes were divided *transversely,* so that there were crown-end and root-end sets in different rows. The actual comparative result was not, however, ascertained, because the man employed, did not notice the markers, at the time of digging, and mixed the whole crop. By this oversight, I am prepared only to state, that from 24 lb. of these kidneys, I obtained a return of 356 lb.

It is now left to the experience of the reader to determine whether these crops surpass those of common culture; and it remains to observe, that all the early varieties were trench planted, and among those, I include the first variety of kidney, at the head of the list. The keepers (2–5) were planted row by row, during the process of digging, and the rows generally four feet asunder. Thus the ground, which had previously been under *broccoli*, was digged to the extent of five feet; then a line being stretched, a drill-trench was chopped down with the spade, drawing the loosened soil forward, six inches deep. The sets were herein deposited, five or six inches apart, and were covered with earth made very fine and light; then another space was digged, and a second trench struck out and planted. I have, in the present season, made a further improvement, by sprinkling an inch-deep layer of light hot-bed manure, over the surface of the ground which covers the tubers; thus each row is clearly marked, the soil protected, and enriched, to the width of a foot, without bringing manure into contact with the potatoes. After a time, when the haulm has become six inches high, the intervening spaces are fork-digged, or the soil otherwise, by hoe or spade, rendered light; the little manure which remains is thus intermixed with the surface, and about two inches of earth is drawn over it, and against the stems on each side; this is all the earthing I allow. The soil remains loose and free at top, over a more solid stratum beneath. This is the actual condition the plots are in at the moment of writing (July 29).

It has been conjectured by many, who have accordingly adopted the practice, that potatoes may be planted year after year in the same land. I have never risked the trial to an extent sufficient to decide the question, and, indeed, the difference of soil would at once throw an obstacle in the way, which could not be surmounted; but as far as I have seen, a loam constituted as mine is, does not appear to bring two successive crops of the same potato to a corresponding degree of perfection. It is not to be doubted, that all plants convey into the soil matters either gaseous, fluid, or solid,—for the odour diffused will prove the fact to a demonstration; therefore, without dwelling upon the theory of radical, fecal exudation, or claiming the admission that, by analogy, whatever a plant *throws off from its system cannot become salubrious food for an-*

other of its own species, it certainly appears reasonable to vary the crops according to the order of rotation, either in the field or garden. I have acted by this principle, and, whenever it has been in my power, have planted one or other of the cabbage family after potatoes.

But in reasoning by the rules of rotation, we must not be led away from particular facts. The tubers of the potato-plant do not appear to derive support from the soil, they being appended to processes which are conduits of supply downward or laterally from the leaves and stem; the sap-fibres which convey the fluids upward are wholly independent of these processes. Just in proportion to the amplitude of foliage, duly exposed to the sun and air, is the bulk of the crop; hence, although manure, *or humus*, becomes decomposed by the action of the proper roots, and is by them conveyed in the form of raw sap to the herbage, the ground does not become impoverished by the potatoes themselves, however numerous they may be, they being organic bodies (*propagines*), or systems of life,—a congeries of new plants imbedded in a pulpy and amylaceous mass, which has no connection whatever with the soil. Hence, also, as the potato is thus viewed as a product of the leaves, it becomes the recipient of the exudation, which it thus prevents from contaminating the ground to any considerable extent; and thus, upon the theory of fecal exudation, the potato may be planted year after year on the same spot of ground, with comparative *safety*, but by no means advantageously.

Little remains to be said. The crops I have produced, and their excellent quality prove, that the rows may stand widely apart, and thus furnish ample space for the horizontal expansion of the radical processes, without causing any diminution of the yield; for what is lost in space one way, is made up by the proximity of the sets in the rows.

The loam (as a staple, naturally) is composed chiefly of a *gritty gravel*, containing a little chalk, more iron, and a moderate portion of alumina—the matter of pure clay; its vice, is the condition of the sand, or silicoous constituent, which renders it binding, under the influence of a hot sun, after rain. A *perfect loam* requires the silex to be in a state of minute division. If this fine silex abound, even to the extent of five-sixths of the whole bulk, leaving the remaining sixth to be composed of alumina, sub-oxide of iron, of a light ochre tint, and chalk (*carbonate of lime*), the loam will be rich, unctuous, and of high quality; but if a considerable portion of the silex is coarse (the detritus of gravel), the texture of the loam becomes vitiated, and it sets like a brick. Those loams, wherein the iron exists, in the form of a per-oxide, assume a purple, or red tint; they are abundant in Somersetshire, and are the staple of permanent fertility.

Agriculture, or the science of cropping and rotation, will never be duly understood, till the constitution of all loams, and their power of decomposing manures *under the stimulus* of the *vital*, *vegetable* principle be accurately determined by experiment.[*]

STUDIES IN AGRICULTURE.—NO. III.

Weeds—Moss in Lawns and Pastures.—With the exception of the barren tracks of desert in Africa, Arabia, and a few other places, it would appear that, in the original design of the creation, the whole surface of the earth was intended to be covered with herbage and trees. The fiat of the Creator was, "Let the earth bring forth grass, the herb yielding seed, and the fruit-tree yielding fruit after his kind, whose seed is in itself upon [or over] the earth; and it was so. And the earth brought forth grass and herb, yielding seed after his kind, and the tree yielding fruit, whose seed was in itself after his kind."—GEN. i. 11, 12.

Whether or not this interpretation of the passage will bear out the idea of the universality of the covering (with the exception of deserts, as already noticed), there can be no doubt that the reading of the Book of Nature itself—which always furnishes the most certain commentary on the written Word—will fully corroborate our view, as every cultivator of the soil can bring countless instances to prove. For the purpose of bringing the subject more distinctly under the notice of the reader, it may be well to give one or two illustrations.

---

[*] When Mr Towers was explaining the character of the *Ægrostis segetum*, in p. 89, of this volume, we expressed a doubt of the insect described being an Ægrostis. It is but justice to Mr Towers to take this opportunity of stating, that from the facts which he has since furnished, regarding the character of the insect he described, we are quite satisfied that it is the *Ægrostis segetum*, and no other.—EDITOR.

If, for example, the grass sward be pared off from a common or an old pasture, to procure turf to lay on a lawn or grass-plot, the pared surface does not remain long barren and bare of herbage ; for, if no jointed roots of couch or Timothy grass have been left there, from being deeper than the turf pared off, as is sometimes the case, a crop of thistles, dandelion, hawkweed, or coltsfoot, or some such plants, is certain to make its appearance within a very short time, notwithstanding the almost solid texture of the unturned-up ground ; and in a season or two, more or less, according to circumstances, a new sward is formed, to fill up the space which had been rendered vacant.

Still more rapid is the filling up of any piece of ground left unoccupied by crop in a garden or field. Though either of these may have been kept as clear as possible of all extraneous plants, besides what are the objects of cultivation, the unoccupied ground will very soon shew that it cannot long remain in this unnatural state, without a continuance of the artificial means which have been employed to render it so in the first instance. That I am right in terming it unnatural for the ground to be without plants, will appear more strikingly from one or two facts illustrative of the efforts made by Nature ; that is, by the operations of a law, universally impressed upon vegetables by Providence, to fill up all vacant spaces on the earth's surface.

One of these facts may have struck the most incurious observer,—namely, that grass has a strong tendency to appear even on roads and garden-walks, and the streets of towns and villages, the instant any portion of these is less frequented and less trodden than usual. No roadside, out of the main thoroughfare of carts, is altogether free from grass, more or less intermixed with way-bread, or way-bron (*Plantago major*), and knot-grass, or bird-wort (*Polyganum aviculare*) ; and it requires the utmost efforts of the gardener, during the summer months, to extirpate the grass which is constantly springing up, let him do what he will, in the garden-walks; while in towns, and even populous cities, grass may always be seen, in smaller or greater quantity, by the sides of pavements, of common sewers, or near the walls of houses. It is only, however, when this grass is seen encroaching upon the central parts of a street—" the crown of the causeway"—that this attracts much notice, as in the time of the plague in London, when it is recorded as one of the remarkable phenomena, that grass was seen growing in the streets.

The annual poa (*Poa annua*) is the sort of grass which is almost exclusively found in such cases; and it is very remarkable how very universally the seeds must be diffused to produce it in such profusion in places where it is difficult to trace the origin of these, unless they have remained without germinating for an indefinite length of time.

But, though the diffusion of the annual poa-grass is so extensive, it is nothing in comparison with some other species of plants of a very different class. I refer to mosses. The annual grass is confined chiefly to such spots as have just been particularized, and cannot grow without some earth—something of the nature of soil for the roots to draw nourishment from, should that soil be no other than what exists between the joinings of flag-stones, or a *trottoir*, or than the brick-rubbish and oyster-shells which form the basis of a gravel-walk. The moss is far from being thus limited to situation, while it seems to require no perceptible soil, or, at least, little more than moisture, as will readily appear from numerous facts that might be detailed.

The white freestone, of which most of the houses at the west end of the city of Glasgow are built, is taken from the adjacent quarries at Cowcaddens, and near the Lunatic Asylum, and is sometimes raised from a depth of more than a hundred feet from the surface. Now, this stone, whatever may have been the depth from which it has been raised, when it is hewn and built into the walls of houses, and exposed to the rains of that very moist climate, soon shews a green surface, as if it had been painted, particularly in spots where rain has streamed down, which are of a brighter or denser colour than the spots, not so much exposed to moisture. This green, paint-like substance, which Linnæus, from not understanding it, termed a *Byssus*, was demonstrated by Mr James Drummond (formerly of the Botanic Garden, Cork, now at the Swan River) to be nothing else than the germination of innumerable mosses; and, in the case of the freestone of Glasgow, consisting chiefly of various species of screw-moss (*Tortula*), and hygrometer-moss (*Funaria hygrometrica*).

Now, it is obvious that the seeds, or sporules as they are called, of these mosses, must either have been in the stone of the quarry—and, if so, must have remained there from the time the strata were formed—or it must be derived from the atmosphere. We can conceive no other possible source whence it could originate. The circumstances, however, do not clearly distinguish which of these sources is the most probable; but other facts of a similar kind seem to prove, beyond a doubt, that the seeds or sporules of the mosses are derived from the atmosphere.

On the top of a brick-wall, for example, where the burning of the bricks must destroy every seed or sporule that may have been in the clay, while the slaking of the lime, before making it into mortar, must have had the same effect, from the great heat evolved in the slaking—the green paint-like substance of the germinating mosses is no less certain to appear than it is on the Glasgow freestone, though it may be somewhat more tardy, owing probably to the greater dryness of the bricks; for, without abundant moisture, the mosses will not germinate.

It is very remarkable that the germinating moss does not shew itself so readily and abundantly on the same white-coloured freestone of Edinburgh as it does at Glasgow, Greenock, and Ayr, where the climate is greatly more moist, while on the red-coloured sandstone, whether connected with the coal measures, as at Auchinleck, Barskimming, Howford, and Catrine, or the old red sandstone as at Largs and Rothesay in Bute, the mosses do not readily germinate, perhaps because the iron in the freestone, to which the red colour is owing, exercises a deleterious influence, as it always does on vegetation.

On shale and other strata connected with the coal-measures, the mosses seem to refuse to germinate; at least I do not recollect having observed them in such cases in a single instance.

A much more striking and remarkable fact connected with this subject, is familiar to the observation of sailors, particularly in tropical latitudes, and in cases where the ships' decks are not kept so scrupulously clean as would satisfy the vrouw of a Dutch skipper. After heavy rains, in such cases, the deck is soon covered with a similar green paint-looking vegetation to that which appears on the walls of the newly-built houses at Glasgow, and on the top of brick-walls about London, and still more abundantly about Manchester, Liverpool, and Belfast, where the climate is moister than it is at London. Experiments are wanting to determine the species of mosses that thus germinate on the decks of ships; but this is immaterial to my present purpose of noticing the fact, which was to give a very remarkable proof of the efforts of Nature to cover every vacant place of the earth's surface with vegetation.

It may be thought by some that this long detail of minute facts, which do not readily attract attention, has but a slender connexion with the subject of weeds, the intended theme of the present paper; but we shall presently see, that the connexion is no less close than important, with respect, at least, to one sort of weeds, the nature of which (if I am right in my views) has hitherto been greatly misunderstood—namely, moss in old pastures.

The most convenient arrangement of weeds seems to be to consider them as infesting, 1. Grass-Lands; 2. Arable Lands; and 3. Gardens.

In proceeding with the subject, therefore, I shall adopt this division; and though I shall not be able to get through the whole in one paper, I shall, at all events, overtake some of the more interesting points, and hope to be able to set more than one of these in a new light. I shall begin with the first.

Weeds infesting Grass-Lands.—Moss.—Grass, whether of the annual or the perennial sorts, when growing on the same spot for a series of years, tends so much to deteriorate the soil, according to the principles illustrated in this Journal, vol. iv., &c., either by exhaustion, contamination, or both, till the sward becomes less and less thick of grass, unless artificial means be taken to improve the soil, by top-dressings, or by filling up the vacancies with other plants sown on the surface.

But if the vacancies caused in a grass-sward by the deterioration of the soil are not artificially filled up by any of these means, the principle, shewn above to be in active operation over the whole surface of the globe, will cause them to be filled, not with grass, but with some other plants,—weeds, in fact, at least plants, which grazing farmers will consider weeds, inasmuch as they are not such as are eaten by any sort of live-stock.

In order to understand the great difference between the views respecting moss agreeable to our principles, and those commonly entertained which appear to be erroneous, it may be necessary to state the latter. According to the common doctrine, *moss is apt to fix* itself upon the surface of old grass-lands, both meadow and pasture, and to produce much injury by *drawing away the nourishment* of the grass plants, and of course *lessening in a high degree the grassy herbage.* It infests such pastures as are of a clayey moist description, in cold exposed situations the most frequently, *choking the grass by spreading closely over it.* On the contrary, moss is not "apt," but *certain*, to fix itself upon every spot which is bare of grass, in the same way as it fixes itself upon stone and brick walls, and as lichens fix themselves on the bark of trees and on barren rocks, the seeds or sporules floating about so profusely in the air, that, as we have seen, even the decks of ships a thousand miles from land will shew their germination when this is promoted by the moisture or rain, moisture being indispensable no less than warmth. Hence it is, that moss only germinates in warm, moist weather in summer or autumn; but when once it has begun to grow, if the moisture is continued, it will not stop growing on account of cold, any more than snowdrops or crocuses, and even tulips and hyacinths, which grow in defiance of cold during winter, though their seeds would not then germinate.

Like other plants also, the various sorts of moss shew a marked preference for particular kinds of soil and exposure, some (such as *Fontinalis*) growing exclusively in water, some (such as *Orthotrichum*) preferring exposed branches of trees or dry rocks, some (such as *Hookeria*) delighting in very moist banks, and some (such as *Tortula*) growing chiefly on walls, where the sorts that infest grass-lands, which seem to agree best with moderate moisture, are never or very rarely seen. The various species of *Hypnum* are the most prevalent, at least they are the most conspicuous, for the minute species of *Phascum*, *Gymnostomon*, and some others, by no means uncommon in pastures, are too small to attract notice.

These mosses, however, do not "draw away the nourishment of the grass plants," nor lessen these in a high degree; much less do they choke the grass by spreading closely over it; for till the grass fail and leave the soil partially bare, the moss seeds or sporules which are precipitated by rains from the atmosphere would not germinate, or if they did, would themselves be choked by the luxuriance of the grass, inasmuch as moss requires more or less exposure to free air and diffused daylight (not direct sunshine) to ensure its healthy growth. So far, then, from moss choking the grass, it will only spring up where the grass has begun to fail, in consequence of its having either exhausted or contaminated the soil, or both. These views are strongly corroborated by facts stated in the paper of Mr Thomas Bishop (*Highland Society's Trans.* xii. 285), which has come to hand since a great portion of this communication was written:—"The growth of musci," says Mr Bishop, "will always be found rapidly to take place when rye-grasses are the only grass-seeds sown (excepting on the very best land), as it is not the nature of that kind of grass to *form a close sward.* The production of them is also much encouraged in older pastures by eating the grass too *bare* in August and the early part of September, as also by taking a crop of meadow-hay where the ground is not much trodden upon, or has been under water in irrigation or otherwise." In fact, wherever bare spaces are left in the sward, provided there be sufficient moisture, which is indispensable, to develop the sporules or seeds of the mosses. Accordingly, instead of agreeing with the opinions commonly promulgated in agricultural works with respect to moss being the *cause* of a thin sward of grass, I consider it as an indication or symptom of deteriorated soil. Nay, for aught that I can perceive to the contrary, the moss may be one of the natural means appointed by Providence for gradually renewing the deteriorated soil, in the same way as it evidently is intended as one of the agents for producing soil on bare rocks and the tops of walls, as already illustrated. The decayed moss in pastures indeed forms a natural top-dressing, in accordance with the same law of Providence, as the fallen leaves in a forest decay and form a layer of rich new soil.

If these views are as correct and true as the facts seem to prove, unless I am very far deceived and carried away by their striking novelty, it would be more preposterous than impracticable to get rid of moss by hand-weeding or hoeing out, it being the natural means of restoring the soil by its decay.

But, independent of this view, there is another of no less importance, which appears to me to be equally correct and equally novel with regard to moss, which may be illustrated by the practice of cultivators in various departments of gardening and agriculture. When the gardener, for example, is desirous of preventing too rapid evaporation from the soil and the retention of moisture, he not unfrequently has recourse to moss to cover the surface of the soil, and never dreams of this having any tendency to choke the plants, whose roots he by this means keeps duly moist. One of the greatest novelties of recent years was the late Sir Henry Steuart's successfully transplanting, in Scotland,* the largest trees, without, as heretofore, disfiguring them by lopping off their branches, and the success of the method mainly depended on keeping the roots (unbroken and uninjured as far as possible) in a due state of moisture for at least two years after removal. This was effected by mulching with dung, but still more effectually by placing over the soil where the roots were spread a thick layer of moss or schaws (the refuse of flax-mills), according as the one or the other could be procured.

When plants are cultivated in pots, one of the greatest obstacles to their thriving is exposure to the more rapid evaporation of their moisture than when they are planted in the open ground. The air circulates around the pot and dries its surface, while the moisture in the soil within is absorbed in part by the porous texture of the sides of the pot, at the same time that the ordinary evaporation takes place on the surface of the soil. But if this surface be covered with moss, evaporation there is greatly checked or entirely prevented, and the most important roots, those, namely, immediately proceeding from the crown, are kept in a due state of moisture.

---

* In the drier districts of England it does not answer, from the deficiency of moisture.

It may be objected to my illustration, that the moss thus laid around the roots of trees which have been transplanted by Sir Henry Steuart's method, as well as that used by gardeners to cover the surface of garden-pots, is *dead* not growing moss, and that consequently it cannot exhaust the soil as growing moss may be supposed to do, and if so, must rob the pasture grasses of their appropriate food. This objection, however, proceeds upon a want of knowledge of the anatomy and physiology of mosses, and could not have been made by any skilful cryptogamic botanist; for mosses have only extremely slender hair-like roots, are seldom more than an eighth part of an inch in length, and lie as it were only on the surface, their chief nourishment being derived from the moisture of the air by means of their leaves. So delicate and slender indeed are these roots, that Mr James Drummond, and other enthusiastic muscologists, have found it extremely difficult, often impossible, to cultivate the rarer sorts by the greatest care in transplanting them. It is, therefore, a fallacy to suppose that mosses have any very injurious influence in exhausting the soil. The root which first protrudes when the sporule or seed of a moss germinates in most species, soon decays and dies, along with the lower part of the stem, while the secondary roots, as they may be termed, spring from the upper part of the plant, often in considerable numbers when fostered by coming in contact with moisture on the surface of the soil.—*Hedwig, Von Bridel*, &c.

Another important artificial use of mosses is to protect the roots of trees, or of plants in pots, from the effects of severe frost, in consequence of their texture being non-conductant of heat. In pastures, accordingly, mosses must have a similar influence in protecting from severe frost the grass-roots (usually spread near the surface), when these are sparsely distributed over the sward, in consequence of exhaustion or contamination of the soil.

So far, then, from mosses being injurious in pastures, by their impoverishing or otherwise deteriorating the soil, or by choking the grass, they are, on the contrary, clearly beneficial in protecting the roots from being parched during a dry summer, and from being frozen during a severe winter.

Extirpation of Moss.—The views which I have just ventured to suggest are strongly corroborated by the methods which have been proposed in practical works on agriculture for extirpating them. We shall quote one or two of these methods to explain the application of our principles.

The editor of the *Complete Farmer*, on the authority of a practical agriculturist, remarks, that as moss requires a considerable proportion of superficial moisture to promote its growth and extension on the soils which it infests, it is probable the application of such substances as have a tendency to absorb moisture, and counteract the superabundant degree of wetness by which it is supported, must be of great utility and advantage. With this intention, lime has been applied evenly over the surface with much benefit. The practical farmer, however, experienced greater advantage by covering mossy grasslands with a thin even coating of alternated calcareous matter, in union with a sandy material, such as is scraped up from roads, when formed into a compost with about one-fourth part of well-rotted farm-yard dung; as, by this application, a new and more vigorous description of grasses spring up, which soon overpowers the moss plants, and at length wholly destroys them.

This, it may remarked, agrees much more completely with the account which has just been given above, of the origin and progress of moss in pastures, than with that which represents moss as choking the grass; for if the moss does choke the grass by spreading over it, how can the grass overpower and destroy the moss.

Mr Kent and others recommend the penning and folding of sheep on pastures infested with moss, for promoting the improvement of such lands, as well as of bringing the herbage into a finer state. According to Kent, this method may probably be had recourse to with most success, either at the close of the summer season or early in the spring months; and he prefers the latter, because, in consequence of the grass immediately covering the surface of the ground, more effect, he thinks, may be produced on the mossy vegetation. The benefits derived from this method are of various kinds, the dung and urine of the sheep operating, on the one hand, as manure, promoting in this way the vigour of the grass; and on the other, the treading breaks the close-matted surface of the moss and destroys its small roots. This is in entire accordance with the principles advocated in this paper.

Mr Kent is also of opinion, that harrowing with short, sharp tined, light harrows, is a practice which may be found useful in some cases, more particularly before the application of lime, compost, or the folding of sheep, as by such means the matted texture of the moss is broken down, and rendered more open and fit for admitting the manure to the roots of the grass, thus exerting its full influence in promoting the vigorous growth thereof, and at the same time the spreading of the moss is said, on the same authority, to be in some measure prevented. After such harrowings, it has been recommended to sow grass-seeds, and particularly Dutch clover over the surface; but though the clover may grow if the ground has not previously been over-cropped with it (See *Quart. Journ. of Agric.* vii. 466–7), it is plain that the sowing of grass-seeds can, if our principles be sound, only increase the evil it is intended to remedy.

Top-dressings, and bush-harrowing, and all such expedients, however, are, as Mr Bishop well remarks, very expensive, and their effects evanescent; and he recommends, as " the last and most efficient remedy, and the easiest to have recourse to," provided, however, that the land " has not become altogether exhausted, or in an over-damp state," is to waste, as we would say, the summer's crop of grass by allowing " a great portion" of it " to remain unconsumed on the ground until the following winter." This of course may be done on lands and the like where the value of the grass is not an objection, but it would never do for a grazing farmer who paid rent. The leaving a great portion of the grass on the ground, will, of course, prevent the germination of the moss sporules or seeds, or it will tend to choke the young plants, if such should germinate though it is obvious the loss must be as much, or more, than the expense of any top-dressing. If the grass again, were left to wither, it would in part form a top-dressing, but it is very questionable whether this would not prove to be as much in favour of the next year's crop of moss, as it would be of grass the land having stood another year's deterioration of the soil

Mr Bishop, however, does not recommend the left grass to rot on the sward, but to have it eaten down with sheep or horses (we presume), as he says, " the barer it is eaten before the new growth of spring, the finer will be the following summer's grass." But here, again, it must be obvious, that if the grass is eaten bare, the moss sporules or seeds, washed in by rains into the bare intervals between the grass plants, will germinate in the spring, and acquire strength before the young shoots of grass from the old root-stools can overpower them. In this way the benefit derived from the eating down so far as the trampling of the sheep and horses, tends to destroy the young moss already germinated, will be more than counterbalanced by the greater extent of bare surface left for the fresh germination of mosses.

Mr Bishop, however, does not appear to be at all sanguine as to this remedy, and it would be marvellous if he were, for he concludes, that if " the repetition of this treatment fail to extirpate the musci (mosses), it will be profitable to put the grass lands under a rotation of crops, and sow them out anew with a mixture of grass-seeds suited to the soil and climate" (*Ut ante*, p. 286), which is in fact the only scientific and rational remedy.

The thorough draining and trench ploughing recommended by Mr Smith of Deanston, in the pamphlet, which should be in every farmer's hands, published by Drummond of Stirling, is a much more likely means of warding off the increase of mosses in permanent pasture, as it operates in two ways, producing a fresh soil by the ploughing, and carrying off the excrementitious discharges of the grass through the draining. In lands, accordingly, which are properly irrigated, though it might appear at first view that the germination and growth of mosses would be greatly promoted by the moisture, it is not found in practice to be so, for the grass is so much improved in vigorous growth as to leave no room for moss. I never observed, therefore, in Switzerland and the Black Forest, where irrigation is so universal, that there was any reason to complain of moss infesting the grass lands.

Mr Boswell of Kingcausie, in an admirable paper on the unprofitableness of old pasture compared with new (*Quart. Journ. of Agric.* iv. 783), shews very forcibly at what value we must estimate top-dressing at least as a general practice. "Long," says he, " did I toil at top-dressing; all the never-failing, oft-recommended recipes of this compound and that compound I tried in vain; peat-earth, in all the varied shapes of mixture with lime and dung, soot, composts, with scrapings of ditches ' or other matter;' all these I tried in various ways. I exhausted the pharmacopœia of agricultural quacks, but I soon found out that without the aid of the plough and harrowing nothing could be done, in other words, that the ground must be put into good heart before you can have good grass. Well, that being done, I had fine grass, but it grew bad again; it was not fine permanent pasture. I had once more recourse to the old system of top-dressing, and of course improved the pasture, but again it fell off." I might, indeed, quote almost every word of Mr Boswell's paper, as strongly corroborative of the views which I have above attempted to establish.

In conclusion, I think it may not be without use succinctly to sum up the doctrine here maintained respecting moss as a weed in pastures and grass lands.

1. Unlike the eggs of insects, *none of which* can float about in the air in consequence of their great specific gravity, while the greater part of them are glued to some substance at the time of laying, the seeds or sporules of mosses being very minute and light, are profusely diffused through the air, and are carried down by rains to every part of the surface of the globe, filling the waters as well as the lands with their myriads.

2. That these sporules or seeds of mosses will germinate and braird both in water and on land which is sufficiently moist, provided the temperature be not too cold.

3. That the roots of this braird of mosses are so short and slender as to require very little depth of soil to nourish them, and only require moisture as indispensable.

4. That after germinating, they will perish if moisture be withdrawn, but will continue to grow, though the temperature be reduced greatly below what would have been sufficient to cause them to germinate.

5. That besides moisture, the mosses will not advance in growth after brairding, without a certain portion of light and free air, and hence will not thrive where grass is luxuriant or the sward close.

6. That all grass lands have a tendency to become exhausted, contaminated, or both, in proportion to the length of time, the grass continuing to grow, in the same way as wheat lands will not continue for a succession of years to bear good crops of wheat.

7. That when vacancies in a sward are produced by grass being grown there during successive years, the sporules or seeds of mosses are deposited on such vacancies or bare spots in the sward by rains, and will germinate and grow there if they have sufficient moisture.

8. That moss, therefore, in grass lands, is *not a cause* of the grass falling off in quantity, but *an effect* of such falling off—a symptom of the general disease, and not in any degree the producer of the disease.

9. That the methods of destroying moss recommended in books on farming, and by practical men, from not being based on rational principles, are altogether nugatory and vain, so far as the extirpation of the moss is concerned, the only really effectual remedy for the falling off in grass being breaking it up, draining and ploughing.

10. That where this is not convenient, top-dressing, and still more irrigation, will be found an excellent *temporary*, but merely a temporary, expedient.

When I entered upon this subject I had no idea it would have occupied more than two or three pages, but it has led me into such prolix details, that I have not room at present even to hint at the other weeds which abound in pastures, though this is a topic of no little interest, and I expected to be able to overtake the whole of it in this communication. I. R.

ANATOMICAL EXAMINATION OF THE WILD OX OF SCOTLAND, WITH SOME REMARKS ON ITS NATURAL HISTORY.*

By Dr Knox.

It is familiarly known in this country that a breed of white cattle has been preserved for a great number of years in the park of His Grace the Duke of Hamilton, at Cadzow, near Hamilton, and that a similar race of cattle, similar, at least, in so far as regards colour and tradition, has been preserved with great care by Lord Tankerville, at Chillingham, near Wooler in Northumberland.

The popular belief in respect to the wild cattle, as they are called, of Lanarkshire, and of Northumberland, belonging to the Duke of Hamilton and to Lord Tankerville, is, that they constitute the remains of the ancient cattle of Britain; of a race of cattle, in fact, which existed long prior to the conquest of Britain by the Romans; that they came into the country with the earliest inhabitants, whoever they were, or were, perhaps, even aboriginal, *i. e.* existed prior to the occupation of the island by its earliest human inhabitants; and that *this breed*, after many crosses with foreign and domestic breeds, gave rise to the present numerous, I had almost said endless, varieties of cattle which ornament and so greatly enrich Britain. But, as in most inquiries over which antiquity has thrown her mantle, great difficulties are met with when an attempt is made to trace the natural history of these cattle to its origin. Who the earliest inhabitants of Britain were, is not known, neither does history furnish any data to enable us even to conjecture from what part of continental Europe they migrated, or if they migrated at all; whether or not they brought their cattle with them, or found that bounteous Nature had already supplied this important want of man, by stocking the woods of ancient Britain with oxen of *one*, or of *several races*; these are questions to examine which satisfactorily, history provides no data whatever.

Since it seems impossible, then, to trace the origin of the white ox of Britain, it only remains to endeavour to revise its history from a period which is well known, towards that which is less known, or altogether obscure, at which, of course, all legitimate inquiry stops.

---

* Read to the Royal Society of Edinburgh. Session 1837-8.

For convenience sake, I shall arrange my observations under three heads, *first*, The anatomical remarks; *secondly*, A few notices respecting their natural history; and, *thirdly*, The evidence of history in respect to them.

I. When M. Cuvier was preparing that section of his great work on Organic Fossil Remains, which treats of the "fossil bones of oxen" (*ossemens des bœufs*, p. 107, vol. iv. 3d edition), he found himself necessitated to re-examine with great care the natural and economical history of the now existing domestic ox, of the buffalo, and of the urus, since naturalists, writing as usual from conjecture, and respecting matters of which they were entirely ignorant, and which, from their education, or want of education, they are usually unable to understand, had failed to give the requisite scientific information, upon which alone an anatomist could found any opinions. I have read over thrice, with all the care in my power, the 3d chapter of his 4th volume, which treats of these matters, and have arrived at the following conclusions.

M. Cuvier having found that the views of naturalists constantly misled him, trusted chiefly to the anatomical characters of the cranium, the rest of the skeleton not furnishing data quite so important, although in some species presenting differences sufficiently well marked. All the domestic breeds of cattle found in civilized Europe, the small ox of Scotland, the large horned oxen of Romania, the ox without horns, the various kinds of domestic cattle throughout Africa, the Indian zebu, large and small, with horns and without, finally, the cattle of the ancient Egyptians, as proved by the embalmed crania, taken from the tombs and grottoes of Upper Egypt, by M. Geoffroy, all these he considers the same, and of one species.* This opinion he seems to me to have arrived at chiefly, if not solely, from an examination of the cranium, whose characters he sums up as follows. Forehead flat and even a little concave, square; its height being nearly equal to its breadth, the inter-orbitar space being assumed as a base. The horns are attached to the extremities of the most elevated projecting line of the head separating the forehead from the occiput. The plane of the occiput, which is quadrangular, forms an acute angle with the forehead. Now these characters, he affirms, exist in all the varieties of the ox just enumerated.* We shall not stop at present to inquire into the accuracy of this opinion. It is founded, as I have said, upon two characters or circumstances, in the history of the domestic ox, neither of which seem to me strictly applicable to the case. The *first* is the anatomical character of the cranium, which M. Cuvier considers as *specific*, but which, after all, may be only *generic*; and, *secondly*, the *supposition*, for it is nothing more, that these domestic oxen, including also the wild ox of Cadzow and Chillingham, as they are called, will, under common circumstances, breed freely with each other. Now this has not been proved satisfactorily to the physiologist, by an unexceptionable experimental inquiry.†

---

* I learn from two practical men, in whose opinions I place great confidence, Professor Dick, and Mr Black, land-steward to the Duke of Buccleuch, that the theory of M. Cuvier is the one most generally received in this country.

Previous to M. Cuvier's researches, naturalists had, in their usual style, confounded the aurochs of Lithuania and of Poland, with the domestic ox, and had mistaken the former for the type of the latter. M. Cuvier proved their anatomical characters to be quite different, that they constituted distinct species, and no doubt had done so since the creation of the world. As no one has questioned this determination of M. Cuvier's, I need not insist upon it.

---

* I find, on further inquiry, since this Memoir was written, that the most experienced breeders in Britain maintain the same opinion.

† A properly conducted experimental inquiry would necessarily incur considerable expense, and could be conducted, therefore, only by such an influential and wealthy body as the Highland and Agricultural Society. Since this Memoir was sent to the press, Mr Black of Dalkeith, whose practical knowledge of the qualities, good and bad, of all our domestic breeds of cattle, is of the very highest order, shewed me the product of a cross, between the white bull of the Hamilton breed, and a Shetland cow. The product is a very good looking polled ox, *nearly quite black*, and greatly superior in weight to the Shetland cow. But the facility with which a cross may be obtained between the wild ox of Hamilton, and any strictly domestic breed, does not prove an identity of species; we should require to know, if this cross can support its qualities and appearance, can in fact maintain itself without either dying out, or returning to one or other of the original races. Now this has never been proved.

The buffalo, which is now in some measure domesticated in Italy, Egypt, and Greece, was unknown to the Greeks and Romans, at least as a domestic breed. M. Cuvier supposes its introduction into Europe to have happened about the end of the sixth century. Its native country is unquestionably India, and the Indian Archipelago. On the other hand, the Bos-Caffre, or Cape Buffalo, is a perfectly distinct species from the Indian, extending from the Cape northwards, to an unknown latitude. It is a ferocious animal, and I should think difficult of domestication. I have often seen the Bos-Caffre in its wild state, and knew of one instance in which the cow calf had been taken and brought up with a herd of domestic oxen. When I saw it, it had grown to a considerable size, retained the savage look of the species, disliked handling, or the approach of man; and although it fed with the farmer's domestic cattle during the day-time, and returned with them in the evening to the cattle-pound, it was always shy, and kept as much apart as possible. What became of it I do not know. Having thus determined these three distinct species, M. Cuvier next shewed the Bos-Muscatus, or musk ox, to be distinct from the others. But the Indian arni he views as merely a variety of the common Indian buffalo. And of the gyall of India, or Bos-frontalis, M. Cuvier declines giving any certain opinion. The yak, or Bos-grunniens, he considers as a distinct species. The American buffalo, as a species distinct from all others, admits of no sort of question.

In an article following the history of the living species of the ox, M. Cuvier discusses, with his usual sagacity, the more difficult question of the extinct or fossil kinds, which he reduces, although on very imperfect data, to *three*. *1st*, The remains of an animal which must have greatly resembled the now existing aurox; *2d*, another resembling the common ox; and *3d*, one not unlike the musk ox of Canada.

The fossil remains of the first species, or that resembling the aurox, have been found in Germany, Italy, Prussia, Siberia, and America, and some geologists may be disposed to consider the species a type or original of the now existing aurox; but to such a theory there are objections. Of the second species of fossil oxen, or that supposed to resemble the existing domestic ox (and M. Cuvier seems to have had no doubt of this being the type of all our domestic cattle), the crania only, so far as I know, have been found, and *their vast size* seems to me a great objection to M. Cuvier's theory. I may here state, what I believe to be a fact, that hitherto *no fossil cranium* has ever been discovered, strictly resembling the head of the domestic ox in all respects.

Since writing the above, I perceive that Mr Swainson* views these fossil crania † as the remains of a formidable race of animals which once existed in Britain, even during the historic period, but in a wild state. Mr Swainson adds that they belonged, without doubt, to the species named urus by Cæsar and other ancient writers, and that these skulls not only possess a specific distinction, but exhibit a type of a form essentially different from that of the domestic ox. ‡ Mr Swainson goes on to add his reasons for these opinions, which I had better give in his own words. "All these skulls are nearly one-third larger than those of the bos taurus; they are square from the orbits to the occipital crest, and somewhat hollow at the forehead. The horns placed at the side of the above crest, shew a peculiar rise from their roots upwards; then bending outwards, and then forwards and inwards. No domestic race shews this turn, but numerous specimens of inferior sizes, found fossil in some of the Cornish mines, have this shape, and the wild bull of Scotland, the only example of this type ever known to exist, retains it. The domestic oxen, on the contrary, of whatever country or breed they may be, have the square concave forehead, with the horns rising from the ends of the frontal ridge." In addition to these remarks, which are directly opposed to the anatomical examination of M. Cuvier and of myself, Mr Swainson has added some curious speculations in regard to the Scottish ox, on which I shall have occasion to animadvert afterwards; in the mean time, I may take the liberty of observing that the skull of the fossil ox scarcely differs from the domestic one in any respect *but in size*, and therefore his observations on this point are not well founded. Again, I had thought that many of the domestic breeds of England have horns following precisely the direction of the Chillingham and Hamilton breed of cattle, so that his remarks that *no* domestic race *shews the turn of the horn*, of the fossil breed, must also be a somewhat rather hasty observation. Moreover, the wild bull of Scotland, which he is pleased to consider as the only example of the fossil type now known to exist, instead of having large horns like the fossil breed, has either comparatively short horns, or none at all;[*] and when present *they follow precisely the direction observed in those of the surrounding domestic breeds.*

---

* Lardner's Cyclopædia. Nat. Hist.

† The fossil crania here referred to are of a very large size; there is a specimen in the Barclayan Museum, Edinburgh, and specimens may be found in most museums throughout the kingdom.

‡ By this I think Mr Swainson must mean that they are even generically different.

Mr Swainson's observations respecting specimens found fossil in some of the Cornish mines would be extremely interesting, provided it were proved that such crania really are fossil, and do not belong, as they probably do, to the common existing domestic breed of cattle. Notwithstanding these remarks, I beg it to be understood that I have always considered our domestic breed of oxen, including the pretended Urus Scoticus, as being a race of animals composed of different *species* with whose original types, both in respect to colour and number, we are unacquainted; and this opinion seems to agree with that expressed by this most eminent of modern naturalists.

At this point of the inquiry it always seemed to me a matter of much interest to ascertain the exact history of the pretended wild oxen of Britain, and to gather from their anatomical characters, to which variety of the domestic ox they most approximate, or if there really existed in them any specific differences worthy of notice. But in the conducting of this part of the inquiry, I have experienced very considerable, and, as I anticipated from what I knew of the deplorable condition of

---

[*] The two crania so kindly procured to me, by Mr James Wilson, from the herd of his Grace of Hamilton, had no horns, properly speaking, but one, if I recollect right, had two very small horny growths unsupported by a core. This want of horns is not, however, the usual character of the Hamilton breed, since generally both bulls and cows have moderate sized horns, equalling those of the West Highland breed of cattle.

Fig. 1

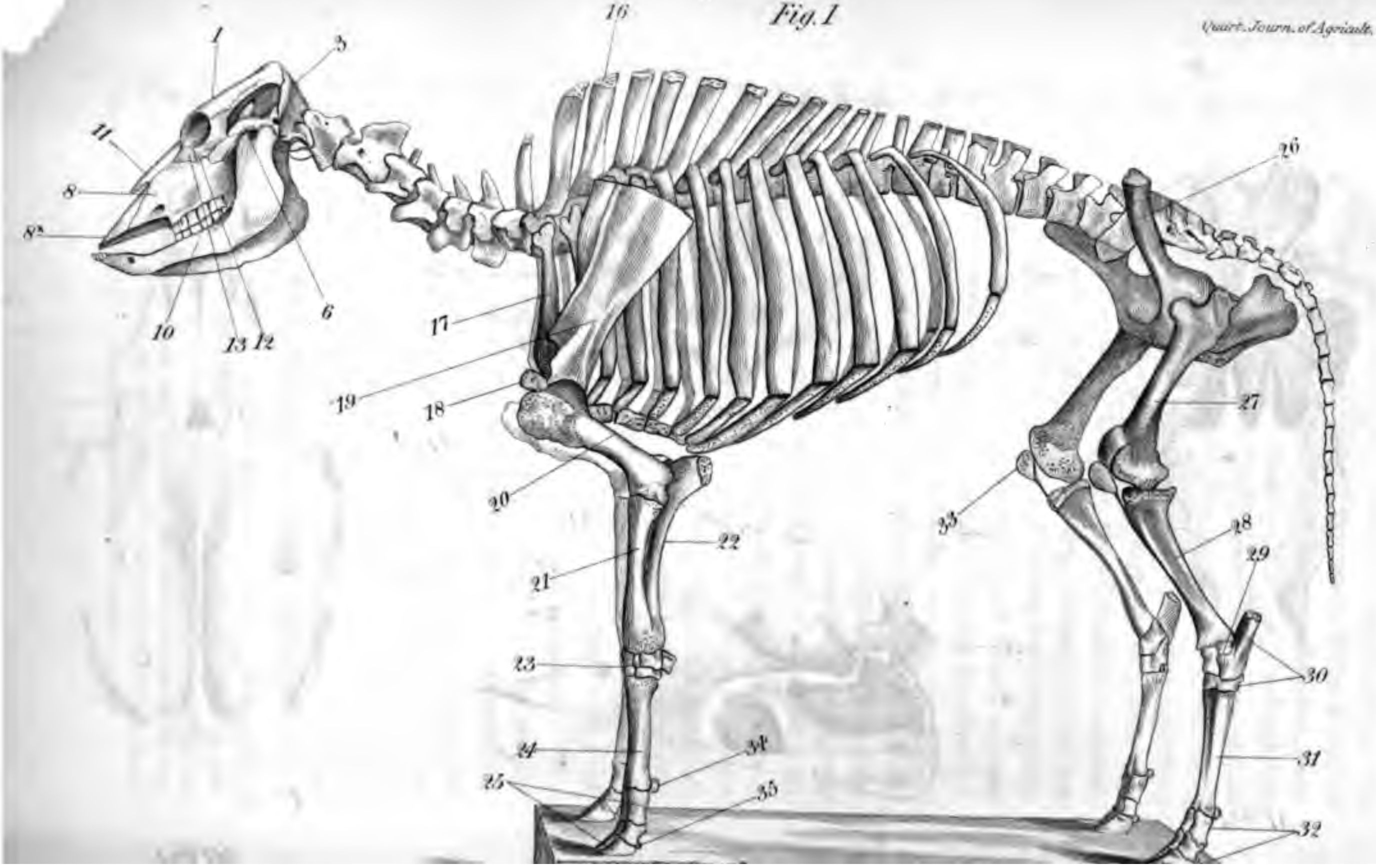
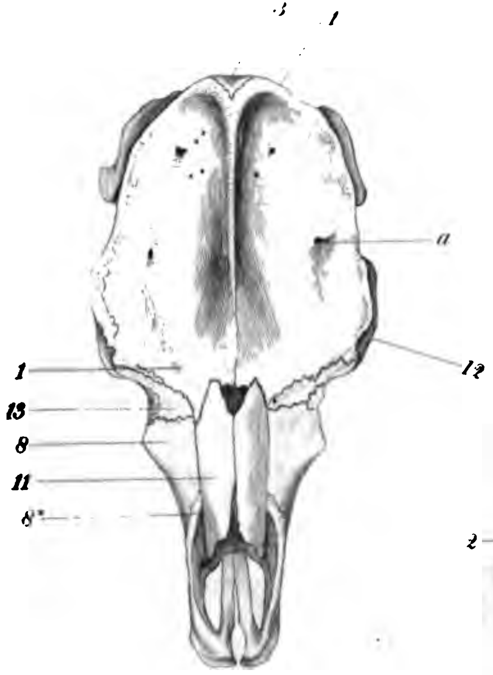

8a

Fig. II

Fig. III



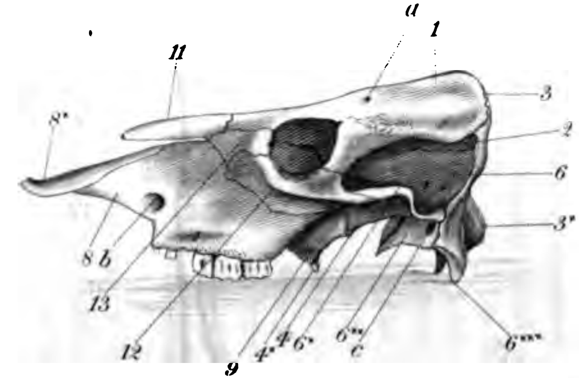


Fig. V

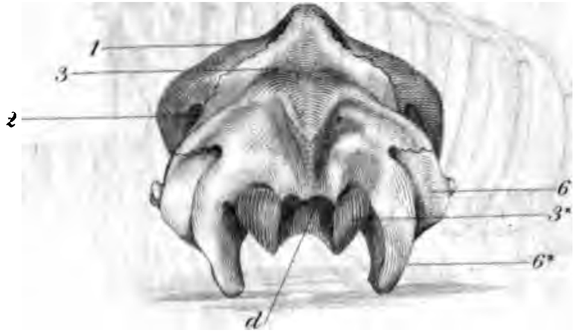
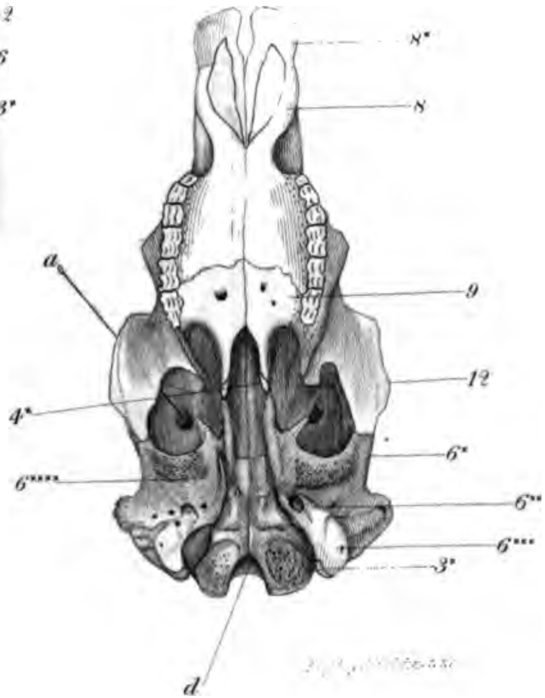


Fig. IV



lit E.J.B.

public museums in Scotland and elsewhere, unsurmountable difficulties. First, I have found nothing like a sufficient extent of *materials* for investigation, naturalists seemingly not having thought it worth their while to inquire into these matters by the only correct mode, *i. e.* by collecting anatomical specimens, as if the whole subject-matter was either above or below their notice. The following list, I regret to say, contains all the specimens I have had it in my power to consult.

1. Cranium of the bull of the Hamilton cattle, which I obtained through the kindness of Mr James Wilson. 2. Another cranium, with the entire skeleton of another bull of the same breed, also from Mr Wilson. 3. The cranium of the Alderney cow, presented to me by Mr Dick. 4. The cranium of the domestic breed of cattle, without horns, presumed to be the Galloway; but of this I am not quite certain, having picked it up in the fields. 5. Two crania of the common domestic milch cow of this district. 6. The cranium of the long horned buffalo of India. 7. Cranium of the short horned buffalo of India. 8. A cranium of an ox, also from India, corresponding in appearance to the arni. All these crania, excepting the first, are in my possession. I have also seen a specimen of the skeleton of the domestic cow, in the possession of Mr Low, Professor of Agriculture; and in the Barclayan Museum, there are the following preparations bearing upon this point:—

1. The skeleton of the common domestic cow, breed unknown. 2. Two crania of the Indian buffalo. 3. Gigantic fossil cranium, similar to the drawing in M. Cuvier's work.

These are the only data I can find in this country; hitherto, I regret to say, that no efforts of mine have been able to procure a specimen of the Chillingham ox.*

Having carefully examined and considered these various anatomical specimens, I have ventured to arrive at the conclusion that several of what are called varieties of the domestic oxen of this, and of various other countries, are specifically distinct from each other, but feel altogether at a loss to say which of the varieties approach nearest to the pure original type, or species of the ox. Or, to express it otherwise, that the endless varieties of the domestic ox of Britain (including also the Hamilton and Chillingham oxen) owe their origin to the crossing of a *certain* number of species which were in the beginning originally and specifically distinct. But which of the now existing varieties, if any, approach any of the original species, whether the white oxen of Hamilton and Chillingham constitute one of these species, or merely a variety, or whether there be at this moment in Europe a race of oxen which actually are derived directly from any of the *original species*, without admixture with other species, is a question which could only be determined by an extended series of carefully conducted experiments, requiring much time, and a *considerable* outlay. It will be more in its place, however, to discuss this amongst the observations I have to make relative to the habits of the wild ox, which I feel disposed to think is *not* generically distinct from the domestic ox, *but to which species*, or, as some call them, varieties, it may be referred, seems altogether impossible, in the present state of inquiry, to determine. But it is evident that other questions are involved here; 1*st*, the wild oxen of Hamilton and of Chillingham may prove to be *mere varieties* of the domestic oxen; or 2*dly*, they may constitute a distinct species; or 3*dly*, they may approach a distinct species, by having been but little crossed with any other.

---

* About three years ago I visited Northumberland for the purpose of examining these cattle, and, if possible, of procuring a cranium, but I was assured by the keeper that this would be very difficult. On inquiring after the specimen which for some years served as a sign to the Tankerville Arms Inn, near Wooler, I learned that it had been sold for a very considerable sum.

The anatomical characters of the cranium differ much from some of the varieties of the crania of oxen now before the society. The forehead is broader, the nasal bones shorter, the turbinated bones differently constructed;—but these, and other less distinct peculiarities which I at first fancied to characterize it from the domestic breeds of Britain, I find reproduced to a very considerable extent in the cranium of the common Galloway, or hornless ox. That I may not, however, unintentionally mislead anatomists, I have added correct drawings of the skeleton and cranium of the Hamilton breed, with measurements and weights which I hope may be useful to the future inquirer.

Explanation of Plate of the skeleton of the White Ox of Hamilton, left side, viewed from nearly opposite the left shoulder. Fig. 1.

1. Frontal bone.
3. Occipital bone.
6. Temporal.
8. Superior maxillary.
8†. Inter maxillary.
10. Inferior maxillary.
11. Nasal bones.
12. Malar bones.
13. Lachrymal bones.
16. Second dorsal or ninth vertebra, its spinous process constituting the withers in common language.
17. First rib.
18. Sternum.
19. Scapula.
20. Humerus.
21. Radius.
22. Ulna.
23. Carpus.
24. Metacarpus.
25. Digital bones.
26. Os innominatum, left side.
27. Femur.
28. Tibia.
29. Fibula.
30. Tarsus.
31. Metatarsus.
32. Digital bones.
33. Patella (right knee).
34. Sesamoid bone.
35. Navicular bone.

Cranium of the same animal, viewed in exact profile. Fig. 2.

1. Frontal.
2. Parietal.
3. Occipital.
3†. Articular.
4. Sphenoid.
4†. Internal pterygoid plate.
6. Temporal.
6†. Zygomatic process.
6††. Vaginal process.
6†††. The mastoid process.*
8. Superior maxillary.
8†. Intermaxillary.
9. Palate bone (pterygoid plate).
11. Nasal bones (left).
12. Malar bone.
13. Lachrymal bone.
a. Supra orbitar foramen.
b. Infra orbitar foramen.
c. Meatus auditorius externus.

Cranium of the same animal, viewed from above. Fig. 3.

1. Frontal.
3. Occipital.
8. Superior maxillary.
8†. Intermaxillary.
11. Nasal bones.
12. Malar bones.
13. Lachrymal.
a Supra orbitar foramen.

Cranium of the same animal viewed from below. Fig. 4.

3†. Condyles or articular portion of the occipital bone.
4†. Internal pterygoid plates.
6†. Zygomatic process of the temporal bone,
6††. Position of the attachment of the styloid process.
6†††. Mastoid process.
6††††. Articular surface forming the temporo-maxillary articulation: the surface is named the glenoid cavity in the human subject; in the ox it is no longer a cavity, but presents rather a convex aspect.
8. Superior maxillary.
8†. Inter maxillary.
9. Palate.
12. Malar bone.
a. Probe in the occipital holes.
*a*¹. Probe in the internal or orbitar opening of the supra orbitar canal, giving passage to the greater part of the first division of the trifacial nerve. This is seldom a canal in the human subject, but a mere notch in the orbitar margin.

---

* The mastoid process in the ox unites with the occipital, instead of the temporal, as in the human subject.

Cranium of the same animal viewed from behind. Fig. 5.

1. Frontal bone.	6. Temporal bone.
2. Parietal bone.	6†. Its mastoid process.
3. Occipital bone.	*d.* Probe in the occipital hole.

II. Mr Culley has described the wild cattle of Chillingham (Lord Tankerville's), and Mr Brown those of Cadzow. Mr Youat, in his History of Cattle, has given a long extract from Mr Culley's observations; and Mr Brown's account of the Cadzow Cattle is inserted in the Naturalist's Library, vol. iv. p. 198.

In respect to the Chillingham cattle, I learned some particulars from the keeper which may not be uninteresting. Occasionally, calves are taken from the cow, and brought up with the domestic cattle of the neighbouring farmer: they grow up quite gentle, and precisely as other cattle. He told me also, that those calves which shewed much appearance of red or black spots, and those born without tails, or with very short ones, were uniformly destroyed. In this way, I apprehend, these cattle are prevented from shewing to what *type or species of cattle* they belong, and their dun white colour artificially, as it were, preserved. In process of time, by being allowed to breed through and through or in and in, they might become red or black cattle, or they might prove themselves to belong to a single type, or might shew varieties indicative of a mixed breed; but the noble proprietor considering the white colour to be essential to their purity, every pains and care is taken to preserve it.*

Of the Hamilton cattle, I feel inclined to say, judging from external appearances, that they differ a good deal in form from those of Chillingham Park. The markings, also, are different; but still there is a strong tendency in the young cattle to cast calves which are said to be "*off the markings*," and to be either entirely black or entirely white, or black and white, but never red or brown. This proves that the Hamilton breed of cattle is likewise interfered with in respect to its breeding, since such calves are uniformly destroyed. Notwithstanding a certain resemblance which the Hamilton cattle bear to the Short-horn or Teeswater, the fact of their not casting brown or red calves (a fact which may be altogether depended on) is a curious circumstance, and would seem to shew, that if these cattle were allowed to breed freely, their disposition is to return to the Galloway or black West Highland breed, but not to the Teeswater.* Of Mr Swainson's theory, that the wild bull of Scotland is (to use his own words) " a perfectly wild, savage, and untameable animal, of which the *Bos Scoticus* is the representative ;" that " it retains essentially all the savage characters unimpaired and undiminished, from the period of its first creation down to the present day ;" that in fact " the *Bos Scoticus*," as he is pleased to call it, " is as untameable now as it was centuries ago, simply for this reason, that in accordance with an unalterable law of Nature, it is intended to represent the worst passions of mankind,—fierceness, or cruelty, or horror," I shall only observe, that these observations, practically, are entirely at variance with what was stated to me by the keeper of Chillingham Park; and it is a fact that the Cadzow breed of cattle may be easily domesticated;* and that, as a philosophic theory, it is mystical, unintelligible, *and of Germanic* origin—a mythic dream, an Eastern transcendentalism, a wild effort of human fancy to unveil the motives and influences presiding at the creation of the world.

---

* Cattle thus interfered with in their breeding cannot be considered an *original breed.*

---

* I cannot agree with Lord Tankerville (see his Letter in the Athenæum, No. 505,) " that the Hamilton breed of cattle, if they ever were of the same breed as those of Tankerville, have much degenerated." To me, on the contrary, they seem an excellent breed, and not in the slightest degree degenerated. His Lordship thinks that they have none of the usual habits of wild animals; but it is well known that they have a singularly wild look, even when confined in small paddocks, and that their flesh is uniformly darker than that of the domestic ox. Moreover, the habits of the cow during and after calving, and of the calf itself, more resemble wild animals than domestic, and indeed are strictly the same as those of the Tankerville cow and calf. Of these singular habits Mr Black was lately an eye-witness, so that the facts are indisputable ; a small herd of the Hamilton breed, in the possession of the Duke of Buccleuch, having furnished Mr Black with the means of observing them. Their antiquity is undoubted, although Lord Tankerville doubts this ; and when I saw them they were not in " a paddock," but in the noble park of Cadzow. But we must feel obliged to his Lordship for having ascertained what naturalists had neglected to do, viz. that a similar breed exists at Chartley Park, belonging to Lord Ferrers. It has been mentioned, also, on the authority of Dr Greville, that a similar breed is found at Ribblesdale. Those at Lyne Park, Chester, Lord Tankerville reports to be quite different. The public is further much indebted to the public spirit of the Duke of Hamilton and Lord Tankerville, for having preserved pure this very valuable breed of cattle. Having become myself a purchaser of two cows of the Hamilton breed, I am in hopes of being able to submit to the public, in a few years, a series of experiments I propose instituting respecting the crossing of this breed with others now in Britain.

III. Since ancient records furnish no proper materials for tracing the natural history of the Wild Oxen of Britain, commencing with their first appearance in this country, it becomes necessary to adopt an opposite course of inquiry.

The latest notices I can find of these cattle, I mean the Wild Oxen of Cadzow and of Chillingham, are contained in two popular works, "The History of British Quadrupeds," by Mr Thomas Bell (Mr Bell must have some strange notions of quadrupeds since he includes under this designation, whales and bats), and the "Naturalist's Library," of which several of the writers are avowedly not naturalists, and therefore of little or no authority. These works, moreover, being of a popular character, ought perhaps to be looked on as compilations of a few of the more interesting facts connected with Natural History, and having no pretensions to scientific accuracy.

Since I have ascertained this to be a very general feeling amongst naturalists, I shall be very brief in my notice of the works.*

---

* I have often heard that Lord Tankerville has constantly refused a *live* specimen of these cattle, even for the purpose of ascertaining, by crossing the breed with other cattle, to what type they belong; but I presume, from his Lordship's well known liberality, that this is but an idle rumour. The Hamilton breed, which his Lordship thinks degenerated, has, on the contrary, maintained its weight and good qualities under the most disadvantageous circumstances. This was first pointed out to me by a most experienced judge of stock, Mr Plummer of Dalkeith. His exceedingly judicious remark was, that "the Hamilton breed of cattle, comparatively neglected, and suffered to breed as it were in and in, by being confined hitherto to a single stock, is yet equal in every respect to the best specimens of the West Highland breed, in the improvement of which so great and constant efforts have been made, both by individuals and by societies; the one receiving as it were the fostering care of a nation, the other protected merely by a single high-spirited individual" (Duke of Hamilton). This circumstance proves also the probable groundlessness of the fears of most breeders in respect to breeding in and in when the stock is a good or original one.

1st, The historian of "British Quadrupeds" repeats tl story of Pennant and Bewick unaltered and uncorrected, r specting the existence of similar cattle in "a few pri parks," without adducing a single authentic fact in favour the opinion that they exist any where but at Cadzow and Ch lingham.

2d, I have in vain endeavoured to trace the figure of t wild ox, prefixed to the article "Bos" in the History of Bri Quadrupeds by Mr Bell, to any authentic source. No *ar name is attached to it*; it has been carefully compared with t engraving of Major H. Smith, with that of Bewick, and wi the engraving of the Hamilton ox in the Naturalist's Librar so that, unless it be a copy of one of the Drumlanrig cattle Scotland which is said to exist in a volume of Pennant's wo but which I have not been able to find in any of our librari the engraving must be a pure work of the imagination.

3d, The heading of the article "Bos," is a curio men of the literature of the day, (the figure without an name preceding it); I give it verbatim—

"*Urus Scoticus*, Ham. Smith. *Bos Scoticus*, Swainson."

As the Naturalists' Library is admitted to be altogethe popular work, compiled by gentlemen, many of whom are n naturalists, it seems out of place to make any remarks r specting the article "Bos" contained in it. Whoever t author of the article may be, he has unquestionably trust

---

[*] I think it must be regretted that, in the attempts to popularize Natu History, so great a mass of error should gradually be allowed to cr in, as is found to prevail in most avowedly popular works. The source this I imagine to be in the employment, by publishers, of half-educa medical men, illiterate tradesmen, and others, to get up popular works Natural History; and the excuse is, that all this suits the public taste, a that such works sell; that they spread a taste for science, &c. Th is another and a wider source, however, of error connected with such p ceedings, I mean the very general belief that "a scientific education is requisite for the observing of facts in Natural History." This popular er prevails universally. The philosophic Pritchard complains of it in his mirable work on Man.

[†] The only authorities offered here are the names of two naturalists w it is very probable never saw these oxen.

too much to the authorities of Pennant and Bewick; the danger of doing so may be best understood, by recollecting that Bewick was an indiscriminate copyist of the works of others, without any critical knowledge to guide him in his choice; and Pennant, though generally trustworthy, was not always so, as has been proved by M. Cuvier. M. Cuvier (*Ossemens Fossiles*) detected Pennant or his publisher in a very shameful imposture of this kind. I give the story in his own words:—"Having found in the British Museum the head of the *musk ox*, he had it drawn and engraved, and to this engraving of the head of the musk ox, he added the drawing of the body of the aurox of Poland, (an animal of an entirely different genus, and probably six times the size), of which he found a drawing in a copy of Cæsar, in folio, Lond. 1712, p. 134; and to this fraud was added another by the author of the Histoire des Voyages (trad. franc. t. i. p. 481), who published the same figure of the auroxen of Poland as the buffalo of the Celebes. He did not even take the precaution to shorten the tail."—*Cuvier*, *Ossem. Fossiles*, t. iv. p. 134.

Major Hamilton Smith, a gentleman whose name is favourably known in natural science, published, in 1827, a very valuable Supplement to Griffith's translation of Cuvier's Animal Kingdom. In that supplement, Major Smith has given a drawing of an animal he calls the wild ox, *Bos urus*, and he has also attached his name to the drawing. But there is not the most remote hint given of the source or sources whence Major Smith derived this delineation; nor, indeed, am I quite sure that it positively has a reference to the wild ox of Scotland, which, in the text, he calls the *Urus Scoticus*, or white urus, whilst on the plate it is called the wild ox, or *Bos urus*. The text contains no proof that Major Smith ever saw these cattle, but rather the contrary; for he says—"We believe that, at present, none remain excepting at Chillingham Castle, the property of the Earl of Tankerville, near Berwick-upon-Tweed; at Wollaston in Nottingham; at Gisburne in Craven; at Limehall in Cheshire; and at Chailly in Staffordshire."*

---

* These localities are stated in the precise order in which they stand in Bewick's work on quadrupeds. General History of Quadrupeds, by Thomas Bewick. Fifth edition. Newcastle-upon-Tyne, 1807.

To this extremely vague statement, he adds a note:—"We understand that there is a large breed, not perfectly white, in the Duke of Hamilton's park in Scotland." Since the above quotations contain all that Major Smith knew regarding these oxen, I hope it may not be considered rash in concluding, that, however valuable his remarks may be in other respects, yet neither such remarks, nor his accompanying engraving, appear to have been drawn from authentic sources.

Tracing the inquiry still farther back, I come next in order to the "History of Quadrupeds" of Mr Thomas Bewick. As a work on Natural History, whether we regard the text or woodcuts, drawn chiefly as they are from doubtful sources, or monstrous stuffed skins, it is beyond all question below criticism. Many of the figures are copies from the most objectionable sources; and hence the two figures which he has given at page 38, of the bull and cow, which he terms the wild white cattle, may either have been copied from Pennant, or be a pure work of the fancy. If copied from Pennant, they are objectionable in the highest degree. The bull resembles in its figure a good deal the Hamilton breed; but the figure of the cow is either very ill drawn, or a pure work of the imagination; in his text, Mr Bewick copies the usual everlasting remarks originally taken from Pennant, and repeated by the servile herd of natural history writers from Bewick to Bell, that cattle like these did or do exist at Chillingham, Wollaston, Gisburne, and Chartley, no attempts having been made by these persons, though residing in England, to verify or disprove such statements. Referring to the text, I cannot find any statement by Mr Bewick that he actually took his figures from sketches made of the live cattle, although he appears to have seen them, but I am not fully assured even of this fact.

There is a valuable remark, however, in his text, if it could but be entirely depended upon, viz. that those cattle at Burton-Constable were much heavier than the Chillingham cattle, and that they more resembled the Hamilton breed in their markings. The figure of the wild bull of Lithuania, or the aurox which Mr Bewick has evidently copied from Pennant, will satisfy any candid person that he was altogether unable to write about natural history. In Pennant's works, notwithstanding the liberties taken with nature and truth by his publishers, we find many valuable facts; and, amongst others, that there existed in his time a breed of white cattle at Drumlanrig similar to that of Cadzow or Hamilton; these are now extinct, having been destroyed by the late Duke of Queensberry. Of Mr Landseer's reputed splendid delineation of "the wild ox of Chillingham, recently killed," it is not in my power to make any remarks, not having seen it, and, on inquiry, I find that no engraving of it yet exists.

It is popularly believed that the wild cattle of Chillingham and Lanark are the descendants of those found on the island when the Romans first visited it. To such a theory, for it deserves no better name, there are many objections. Had the cattle been uniformly, or even mostly, white, so remarkable a fact would, I think, have been noticed by Cæsar in his Commentaries; it is not satisfactorily known what race inhabited South Britain when that great warrior landed on our shores, but it is generally supposed to have been the Cymri, from whom one of the two races now inhabiting Wales are evidently the direct descendants. Had these Cymri possessed cattle like the present wild ox, it is difficult to be understood how they have lost the breed, for assuredly there are none such in Wales at this moment. The Hereford ox, which I have often seen, and think a very valuable breed, is of a red colour, with a broad white stripe down the face; whilst in the south-western parts of Wales, where I have not yet been, the cattle are said to be chiefly black. The Cymri are not a race readily to lose any of their national peculiarities; and it is opposed to all we know of them, to imagine that they would have suffered their breed of cattle to become extinct, or substituted for them another. Again, the cattle of the northern Gael, first cousin, or even perhaps twin-brother to the Welshman, are almost uniformly black or dark red;* they too, it would seem, must have allowed the white race of cattle to become extinct amongst them, if in fact they ever possessed them; now, such assertions are very improbable from what we know of the feelings and habits of the Cymri and the Gael.*

---

* I have been very lately informed by Mr Black, that occasionally the West Highland cattle (which are so very generally either black, or red, or dun coloured) produce a pure white calf. I hope that, when this next happens, some gentleman may have public spirit enough to preserve these white cattle pure, and ascertain the exact nature of the *stock* so formed. I should not be at all surprised if an experiment of this kind were to settle the question respecting the origin of the wild oxen of Hamilton.

When I visited the Parks of Chillingham and Hamilton, I neglected to take notes, at the time, of what was observed; but, speaking from recollection, I am inclined to agree with Mr Brown, Chamberlain to his Grace of Hamilton, that the wild cattle of Hamilton Park are larger, more robust, and their markings different from those of Chillingham: they seemed to me also differently formed. It is difficult to convey to the reader a clear account of these differences, excepting, perhaps, by comparing the Hamilton breed to the Short horn—or rather to the West Highland—which it resembles, and the Chillingham to the Devon breed, to which variety of cattle it may be compared. The colour of the Hamilton cattle is a dun white, the inside of the ears, the muzzle and the hoofs, black; the Chillingham breed have the muzzle black, but the inside of the ears red. The cows of the Hamilton breed, if I have been rightly informed, are frequently polled, and I am inclined to think that this remark extends not unfrequently to the bull of the same breed; the horns generally appeared to me shorter than those of the Chillingham breed.

In Cornwall, where certain of the primitive races of Britain, I mean human races, are still found tolerably pure, the cattle, it is said, are small, of a black colour, and bear a strong resemblance to our Highland cattle. Mr Youatt says, that the

---

[*] There is a curious fact, however, rather opposed to this. Tacitus, speaking of the Saxon race in his time, and whom he calls Germans, remarks that their cattle are without horns. Yet this same race of men settled in Holland, and now known by the name of Dutchmen, had in the course of fifteen or sixteen hundred years, so completely lost all trace and recollection of their original polled cattle, that when their fellow-countryman, the illustrious Camper, stated to them that, whilst in England, he had seen cattle without horns, the Dutchmen refused their credence to so extraordinary a fact, until he imported one or two to prove his statement. About two years ago, I saw at Utrecht two very fine specimens of the spotted short-horn breed, which the Dutch government had purchased in England, and imported at a very considerable expense.

The Saxon race, wherever found, are foremost in the way of improvement.

Pembrokeshire cattle are black, and that this colour is common in South Wales; but it is in South Wales, where can be proved so clearly by those unalterable laws which regulate the form and face of man, that we find the remains of that other race, the Phœnician race of men, so different from the Cymri, the ancient Britains, as they are called, in features, habits, and, indeed, in every peculiarity that can stamp a difference between man and man. Here, then, we have a race of men who probably came into Britain prior to the Romans, and, perhaps, even to the Gael himself, and who, to a certain extent, have remained distinct from them to the present day, and yet we do not find that even they have any cattle resembling the Chillingham or Hamilton breeds.

In the absence, then, of historic facts, it would be rash to offer any conjectures as to the origin or history of the wild cattle of Britain. They may be a distant species from all others, and the present improved short-horned breed may be derived from them; they do not seem to me to have been the original breed of cattle of this country, but are probably an Italian breed introduced by the Romans. It is in a slight degree confirmatory of this remark, that no one has spoken of the existence of similar cattle in Ireland, into which country it is now pretty generally admitted that the Romans did not penetrate. I am quite aware that an opinion did prevail amongst naturalists, that there once existed on continental Europe a species of the ox which some have supposed to have been the same as the wild ox of Cadzow. M. Cuvier inquired into this opinion, and, according to him, the first persons who gave clear notices of a second species of a wild ox natural to Europe, in addition to the aurox, were Pliny and Seneca. Martialis and Poponius, are also quoted in support of this opinion. These authorities are excellent, particularly that of Martialis, if their descriptions were clear enough, but unhappily, in this particular instance, they are not so.

The next author who seems to have followed in expressing the same opinion, was Herbenstein, who asserted, that besides the aurox, there was another wild ox in certain parts of Massovia, and which was there called Thur. It is this animal, in the former existence of which, and its subsequent extinction, Baron Cuvier believes, and the grounds of his belief are—1*st*, the statement of Herbenstein; and 2*dly*, notices in Gesner on the authority of Polish Dictionaries, which explain the term Zuber and Thur in the same manner as Herbenstein. M. Cuvier further thinks that for two centuries this animal has disappeared, and that we can only expect to find its remains in the superficial strata of certain countries. The animal called Thur, he therefore believes to have been (p. 116) the real urus of the ancients, and the original, or the type of the present domestic ox.* It is therefore an extinct species now, in so far as regards its original wild condition; and he further adds, that if any animal might be considered as descending more directly from this ancient species, it would be "the pretended white bison (Le pretendu Bison Blanc) still preserved in some parks in Scotland."

Of this white bison, as the illustrious anatomist is pleased to call our Scottish ox, he says, that he possesses a fine drawing, and that in almost every respect it resembles the domestic ox; he quotes a figure by Bewick, and Pennant's Tour in Scotland. He adds, further, that, under the first dynasty of French Kings, there was a race of wild oxen in the Vosges. Gregory of Tours, who mentioned the circumstance, calls this kind of oxen the bubalus, and he pushes the philological part of the inquiry still further by shewing that what in France was called bubalus, was in Germany called urus.

In conclusion, then, I lean to the opinion that the existence of a distinct species of ox, called Thur, and supposed by M. Cuvier to have been the real "Urus" of Cæsar, and the type of the present domestic ox has not been proved; and that the larger fossil crania dug up in this country, belong to a type of oxen, specifically and even generically distinct from any now existing, of unknown antiquity, and from which not any of the now existing races are descended—that of the domestic varieties of oxen now in Britain, there must be at least two or three distinct species, but that the exact frame and colour of the original types of each is unknown; that it is not improbable that the white breeds of Chillingham and Hamilton may represent one of these types; that what we usually call Domestic Cattle, including the "white ox of Hamilton," constitute a genus comprising several species; that we have no historical or geological data to shew whether or not any cattle existed in Britain prior to its being inhabited, but that to such alone could be given the name of an aboriginal breed, and that all others must have been introduced into the island by the different races who have successively swept over it, whether as colonists or conquerors, and that these, without pretending to determine the order of their arrival were undoubtedly the Phœnician, the families of the Gael and Cymbri (supposing these to be distinct), the Roman and the Saxon; that it would seem, however opposed it is to historic data, that the polled or hornless breed of cattle were introduced into the island by the Saxon race, at least Tacitus expressly mentions that the Germans (by which name he unquestionably means the Saxon race) had cattle without horns. These races of men would, in general, bring their cattle with them, to a certain extent; hence the vast variety of breeds which the island presents, particularly throughout its lowland districts—a variety which, both in respect to cattle and to man, has nearly destroyed the characters of the primitive types, rendering the races indeterminable.

---

* The term *Urus*, as applied to any animal now existing, ought perhaps to be discontinued. According to Cuvier, by *Urus*, Cæsar meant the aurox of Poland: Mr Swainson, on the other hand, conjectures that Cæsar applied it to the gigantic ox (now quite extinct), whose fossil crania have been already frequently alluded to; whilst naturalists have applied it to the aurochs, the American bison, and even to the common ox.

I owe to the kindness of Sir John Graham Dalyell, the directing my attention to the following curious passage in the History and Chronicles of Scotland by Hector Boece.* "The Cosmagraphe and Description of Albion, Chap. 10. p. 39. At this town (Stirling) began the gret wod of Calidon. This wod of Calidon ran fra Striveling throu Menteith and Stratherne, to Atholl and Lochquhabir, as Ptolome writtis in his first table. In this wod wes som time quhit bullis, with crisp and curland mane, like feirs lionis, and thoucht thay semit meik and tame in the remanent figure of thair bodyis, they were mair wild than ony uther beistis, and had sic hatrent aganis the societe and cumpany of men, that thay come nevir in the woddis nor lesuris quhair thay fand ony feit or haind thairof, and mony dayis efter they eit nocht of the herbis that wer twichit or handillitt be men. Thir bullis wer sa wild that they wer nevir tane but by slieht and crafty laubour, and sa impacient that after their taking, they deit for importable doloure. Als sone as ony man invadis thir bullis, thay ruschit with so terrible press on him, that thay dang him to the eird, takand no feir of houndis, scharp lancis nor uther maist penitrive wapinnis. It is said King Robert Bruce, after his coronation, went to ane hunting in this wod, havand bot ane quiet cumpanie with him, and eschapit narowlie of his lief; for ane of the bullis efter that he was sair woundit be the huntaris, ruschit feirslie on the king, howbeit he had na wapannis in his hand to debait himself fra the dint thereof. Incontenent, ane man of grit spreit, quhilk wes standing neir by, lap afore the king, and nocht allanerlie kest the bull be manifest force to the erd, bot held him quhill the remanent huntaris slew him with thair wapinnis. This man, that rescursit the king wes callit Turnbull, and wes rewardit with rich lands be the king. And thoucht thir bullis were bred in sindry boundis in the Callidon wod, now be continual hunting and lust of insolent men, thay are destroyit in all parts of Scotland, and nane of thaim left but allanarlie in Cumarnald."

---

* History and Chronicles of Scotland, by Hector Boece, Canon of Aberdeen, translated by John Ballenden, Edinburgh, 1821.

In the same work, Chap. 15, p. 55, I observe a passage which also bears on the subject of my paper. "The flesche maist frequent amang thame (Scotch) wes othir wild flesche, won on the fellis be thair hunting, quhilk maid them of incredible strength; or ellis it was of *their awin tame bestial*, especially beif, as we do yet in our days. The steirkis, quhen thay are bot young vielis, ar othir slane or ellis libbit to be oxin, to manure the land, bot the quioks war niver slane quhill thay wer with calf, for than thay are fattest, and maist delicious to the mouth. The common meit of our eldaris was fische," &c.

Sir John had the kindness to point out to me, in a work of a later date,[*] at page 521, a further and very interesting notice of the animal. "And of othir grit enormities perpetrate be the erle's men of weir, they have slane and distroyed the dear of his (Lord Fleming's) forrest of Cummernald, and the *quhit ky and bullis of the said forrest*, to the gryt destructione of polecie, and hinder of the commonweill. For that kynd of ky and bullis hes been keipit thir money yeiris in the said forrest, and the lyke was not manteinit in ony vthir partis of the ile of Albion, as is weill knaun." Aggressions by the King's party, between October 1570 and January 1571, from the "Journal of the Transactions in Scotland during the years 1570, 1571, 1572, 1573, by Richard Bannatyne, secretary to John Knox."

---

[*] Illustrations of Scottish History preserved from Manuscripts, by John Grahame Dalyell, Esq., Edinburgh and London, 1806.

REMARKS ON DRAINING LAND, WITH A DESCRIPTION OF THE MOLE-PLOUGH BROUGHT FROM ENGLAND BY HIS GRACE THE DUKE OF HAMILTON.

By Mr AITON, Hamilton.

Draining of land was, till lately, restricted to the opening of outlets for springs that oozed from under the surface of the ground, and rendered the soil where it rested damp or marshy; but that subject has already been so often, and so amply treated of, that it need not be resumed here. Every piece of marshy land requires to be drained in a way adapted to local circumstances, of which, intelligent farmers and labourers are qualified to judge. And in all the arable districts of Scotland, by far the greatest number of marshy patches of ground have been already drained, and every year some of those that remain are laid dry. Much was for some time said and written about Mr Elkington's discoveries, by which springs and stagnated water, forming marshes, were carried off, by merely boring a hole or sinking a small pit in some particular place, to let the moisture sink from the soil to some under strata of gravel, sand, or other permeable matter, through which it could pass to some other outlet. And in other places, the water pent up under the soil was brought to the surface, and the marshy spot laid dry, by tapping or boring a hole from the surface to where the water was lodged. But however well these modes of draining might do in some districts of England, where the strata are little disturbed, and lie nearly horizontal, in Scotland, where the strata under the soil are generally much distorted, Mr Elkington's wimble can seldom be used to advantage, and nothing will do but drains filled with stones, tile, &c. through which the water can percolate. The wimble has, therefore, been but seldom used in Scotland.

The only other method of draining land that seems necessary to be noticed is that of *furrow-draining*, recently introduced into Scotland by his Grace the Duke of Portland, and now fast extending over all the arable districts of the kingdom. As this is one of the most important improvements ever introduced into the science of husbandry, and as some diversity of opinion still prevails as to the best methods of conducting it, I feel inclined to offer a few remarks on the subject, as well as to describe a draining or mole plough, that has recently been brought by his Grace the Duke of Hamilton, from the county of Suffolk, to his estates in Scotland, and which seems to merit attention.

It is well known to every intelligent farmer, that the greatest hinderance to the prosperity of agriculture, and the most serious injury done to the crops of grain, roots, &c. arises from the climate; and especially in the western districts of Scotland, where the fall of rain is copious, and the time it occupies in falling is greater than on the eastern parts of the island. Where the soil is so permeable to moisture, that the rain-water can percolate and find a ready outlet, the superabundance of moisture that falls in rain or snow does little injury to the land or the crops, farther than by carrying away part of the finest of the mould. But where the soil is chiefly composed of clay, loam, or soft earthy matter, the superabundant moisture, having no ready outlet, remains loitering in the soil, and forms it into mortar,—chills the herbage, banishes the richest grasses, or renders them stunted, and raises coarse subaquatic plants, that are neither relished by nor nutritive to live stock. Wherever the *Carex panicea*, or others of that family, set up their blue coloured foliage, they serve to point out to all who see them that the soil is overcharged with moisture, and ought to be furrow-drained. We have not yet discovered the means of preventing an over quantity of rain from falling. The cold blast will blow, and the rain and snow will continue to fall, even to an injurious extent. But when the soil is improved by culture, enriched by manure, and opened to receive and carry off the rain-water as it falls, it will not be so much injured by the weather, because the temperature of the climate will be in part ameliorated.

It has been ascertained beyond controversy, that, when clay-soil that would bring 20s. of yearly rent has been effectually furrow-drained with small stones or tiles, it will repay the expense of draining, from the additional produce obtained from two or three crops, and the land better worth 30s. than it was worth 20s. per acre of rent before being drained. I know of instances where tenants have furrow-drained parts of fields of clayey soil, and the first crop of potatoes amply refunded the expense of draining, (about L.5 per acre), beyond the return of such parts of the same field, every way similar, and manured and dressed equally, that had not been furrow-drained. And it has been found, that, where strong clay-soil has been so drained, that it can be green-cropped and drill-cropped the same as sandy dry land. Such being the case, it must be great misconduct in any proprietor of such land, and especially if it is situated on the western parts of the island, to allow any part of his property to remain undrained. By draining such land, employment is carried out for labouring people, the ground rendered from one-fourth to one-third part more productive of human food.

When the Duke of Portland began draining on his estates in Ayrshire, he had difficulty in getting the tenants to pay 5s. per acre additional of rent, as interest of the expense of draining. But in a few years after, they all struggled with each other for preference, and were quite ready to pay the additional rent. His Grace has not exacted more than 5s. per acre where the land was under lease; but when the current leases expire, he will get twice that sum of additional rent, above what the land of equal quality that has not been drained will yield.

I have always been afraid that where fourteen or fifteen inches of clay soil was laid over the tiles, which is done to prevent them from being broken or deranged by the feet of horses or the plough, there was danger that the clay would, after a few years, become so compact above the tiles, that the water on the surface of the ground would not find its way to the conduit formed by the tiles, but remain stagnant on the soil above them, and render the drain in some measure nugatory. To prevent this, and secure to the water a free passage to the tiles, I have often suggested the propriety of mixing with the clay a portion of gravel, sand, coal-culm, or other such matter as would give free vent to the water from the surface to the conduit at all times. The people in Ayrshire, however, seem convinced that my fears are unfounded, as, where the drains were formed upwards of a dozen years ago, they are still answering as well as at first. I shall be glad to find that they may always prove efficient. But I must mention that no drains in clay-soil will draw beyond six inches, the surface water must therefore find access into them from under the plough furrow.

I am of opinion, that, when the drains are dug to the depth of fifteen or sixteen inches, and only two or three inches wide at bottom, well cleaned, and filled four or five inches with stones, broken as small as Macadamized road-metal, with three or four inches of sand, gravel, or coal-culm above the stones, the drains may, where stones abound, or rock is near at hand, be executed at less expense, and prove every way as effectual, or even more so, than where tiles are used; and I find that many intelligent farmers concur in this opinion.

Some have formed drains with turf, generally termed wedge-drains. These are certainly the least costly of all drains; but in clay-soil, the wedge of clay, trode firm into the drain, must prevent the water from sinking to the conduit below; and if the wedge is not made firm, or if the soil and subsoil abound with sand or small stones, the conduit will soon fill up, and the drain become inefficient.

The only other mode of furrow-draining that I have heard of, is forming and completing the drain with something resembling a plough, termed a mole-plough; and as one of these, formed on the most improved plan of any I have ever seen, has recently been put in operation on the estate of his Grace the Duke of Hamilton, and is expected to answer the purpose of draining at a very moderate expense, it seems highly proper that an account of this improved implement should meet the public eye, so that proprietors and occupiers of land may judge how far it merits attention.

The beam of the mole-plough is eight feet long, strengthened with iron on the under side, and having two handles behind, by which it is guided. A plate of iron, ten inches broad, one inch in thickness, and about twenty inches long, is fixed into the beam by iron-wedges, like a coulter, and it can be let down or drawn up to make the conduit for the water farther or nearer to the surface of the ground at pleasure. On the lower end of this plate, the mole or conical-shaped sock, about eighteen inches long, three inches deep, and two and a half inches wide, is fixed; and which, when the plough is moved forward, forms and leaves open a conduit to carry off the water that may fall into it from the surface, by the slit formed by the broad plate of iron, which is thinned away in the fore edge. A slight furrow-slice is generally cut by a common plough, in the direction in which the drain is to be formed, and which may be replaced when the drain is finished; and as the sock is generally fixed at fifteen inches from the beam, and as the beam moves in the furrow cut by the common plough, the bottom of the conduit is about eighteen inches below the surface of the ground; but this depth can be altered by raising or lowering the plate in the beam, as has been mentioned.

The apparatus by which the mole-plough is moved consists of a strong platform of wood (well supported with iron) six feet long, and four broad, surmounted on four wheels, one at each corner, those before being thirty and the two behind twenty inches diameter. A capstan is placed in the middle of the platform, having its upper axle fixed in a strong beam of wood, supported by bars of iron at four feet above the platform. The capstan is four and a half feet in circumference, eighteen inches in length or height, and is moved round by two horses by a shaft placed horizontally on the axle of the capstan; and by means of a strong chain, 58 yards long, and weighing eight and a half hundredweight, brings up the mole-plough to within two or three yards of the platform, by 22 circuits of the horses, and which they make generally in twelve minutes; and as the platform can be removed to a new station in the space of three minutes more, a drain can be formed about 210 or 215 yards in length every hour.

To keep the platform firm in its place, a strong piece of timber, having a prong of iron, is fixed by a hinge to each of the two hindermost corners of the platform, and which, pointing diagonally, sinks into the ground whenever the horses are put in motion. There are besides two anchors at the fore corners of the platform, which keep the platform from being moved backward by the draught of the chain, which draws up the plough at the rate of fifty-five yards in twelve minutes. So that, with two horses and three men, this plough can be made to form a drain in every furrow of an acre of land, where the ridges do not exceed fifteen feet in breadth, in the space of seven hours or thereby; which is certainly the most speedy and least expensive mode of furrow-draining land that has yet been invented.

It appears to me, however, that although the conduit formed by the plough may generally remain open for a good many years, and its dimensions may be sufficient to carry off all the water that can ever fall into it in ordinary weather; yet I am afraid that the slit formed by the broad plate of iron between the surface of the ground and the pipe, being only one inch wide, may in a short time, from the vicissitudes of the weather, and pressure of the feet of cattle, collapse, so as to prevent the water from having free access from the surface of the ground to the conduit; and if so, the draining would be rendered nugatory. If the mole-plough is put in motion in very soft clay, the slit will not remain open for even a single day; and though it may again open in time of a severe drought, it will close whenever the clay is drenched in moisture. It can only be used in clay-soils, and to the greatest effect in old pasture land.

It is fair, however, to state, that it is well attested, that the land drained by the mole plough in the county of Suffolk several years ago, has more than answered the expectations formed of its utility. As that on the Hamilton estate was only drained last spring, all that can be said respecting it is, that the drains are in general open, and discharging water that could not fail to injure the soil; although in some few places the conduit has been obstructed, and the water has burst up to the surface. The season having been wet, the sedge grasses are still growing over the drains; but some who know the ground well, think the herbage is of darker colour than formerly.

ON INSECTS MOST INJURIOUS TO VEGETABLES AND ANIMALS, AND THE MEANS BEST CALCULATED TO COUNTERACT THEIR RAVAGES.*—NO. IV.

By JAMES DUNCAN, M. W. S.

The preceding notices of the weevil race of beetles, comprehend the greater proportion of the species which have been most noted for occasioning extensive injury to our cultivated plants. But as there are many others frequently met with among agricultural produce, and the habits of all are pretty similar, it seems probable that future observation, when it comes to be more closely and generally applied to the ways and operations of these small "people," will shew that the number should be greatly augmented. Indeed, not a few others might be added, as having already been ascertained to be more or less detrimental; but their depredations being of a more partial character, a shorter account of them will suffice. A small jumping weevil frequently injures, and in some cases, completely destroys, the foliage of one of the finest of our forest-trees, the beech. Its increase appears to be periodical, and it attacks the tender leaves, just as they are beginning to expand, and drills small circular holes through them. When fully opened, the leaves appear completely riddled, just as if they had received a discharge of small shot. We have seen beech-trees at Braid, near Edinburgh, and in other

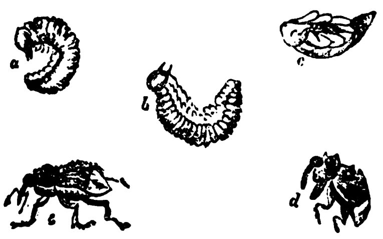
---

[*] The object we have in view by continuing these notices, might be greatly promoted if our country readers, farmers and gardeners especially, were to favour us by sending some account of the injuries they may have received from insects, particularly if attended with any circumstances that may seem peculiarly deserving of attention. We might thus become acquainted with insect enemies to vegetation which have not hitherto been recognised as such, as well as means of destroying them preferable to those we can now recommend. Such communications would be enhanced in value by being accompanied with specimens of the insects, as it is in most cases impossible to determine a species from the description of a writer unacquainted with entomology as a science. Specimens of the injured plants also, when of such a nature as to admit of easy preservation, would be a highly desirable addition. All such specimens as might be found suited for the purpose, would be added, with the name of the donor attached, to a small collection of insects and the vegetables they injure, now forming for the Highland and Agricultural Society of Scotland's projected Museum. They might be transmitted, in the first instance, to the publishers, Messrs Blackwood and Sons, Edinburgh.

places, almost stripped by this minute creature, while in certain seasons very few individuals could be observed. It belongs to the genus *Orchestes*, which may be recognised by having the hind-legs formed for leaping, the eyes approximating to each other, the rostrum curved inwards beneath the breast, and the stalk of the antennæ composed of six joints. The species appropriated to the beech (*O. Fagi*) is oblong, rather narrow, black, and clothed with fine hairs, which have a greenish gloss in certain lights. The antennæ and tarsi are pale; the thickened hinder thigh with a strong tooth beneath. The larva lives beneath the bark, and the perfect insect frequently survives the winter in the same situation. The genus *Ceutorhynchus* (so named, on account of the rostrum being usually inflexed beneath the breast, and therefore concealed), contains a pretty numerous assemblage of small weevils, bearing some resemblance to that just described, but without the power of leaping. Their body is very short and thick, and when they draw in their rostrum and legs, which they generally do when disturbed and allow themselves to drop to the ground, they can scarcely be distinguished from a seed, or small particle of earth. An idea of their structure and appearance may easily be obtained, by examining one of the species (*C. pollinàrius*) which may usually be observed in plenty during the spring and summer months, on the common nettle (*Urtica dioica*). They commonly frequent tetradynamous plants, and as the larvæ take up their abode in the roots, there is reason to believe that they occasion many, if not most, of those diseased excrescences frequently observed on the roots of plants, such as those termed clubbing in cabbages, and anbury in turnips. Mr Kirby informs us, that he has ascertained the knobs on the roots of *Sinapis arvensis*, or wild mustard, to be inhabited by the larvæ of *C. contractus*, a very small insect, scarcely a line in length, of a uniform black colour, slightly tinted with metallic blue on the elytra; the latter with punctured lines. This insect may also be found occasionally associated with the turnip flea-beetle, feeding on the young leaves of that plant. *C. assimilis*, which is one of the most abundant members of this genus, is said to occasion the knobs on the roots of *Raphanus Raphanistrum*, or wild radish; and if its operations are confined to that plant, it might be wished that they were on a sufficiently extensive scale to cause the destruction of one of the most troublesome weeds which infest cultivated fields. The Ceutorhynchi have not been sufficiently attended to, with the view of determining their habits and metamorphoses; the subject is deserving the notice of horticulturists. Their attacks might probably be guarded against by the use of certain kinds of manure, lime for example.

We have thus seen that weevils are detrimental to the seeds, roots, and leaves of plants; and, as if no portion of the vegetable kingdom were destined to be exempted from subserviency to their purposes, other species exist which perforate and consume the trunks of trees. The larva of *Cryptorhynchus Lapathi*, an insect nearly half an inch in length, of a dull black colour, with a band of white scales across the base and apex of the elytra, excavates cylindrical holes in the stems and larger branches of willow and alder trees, which, by admitting the moisture from the atmosphere, greatly accelerates their decay. This species is not very common in Scotland, but it abounds in the southern parts of England, and its operations, combined with those of the comparatively gigantic caterpillar of the goat-moth, and other "auger-worms," so weaken the stems of the trees in which they take up their residence, that they are frequently unable to withstand a strong gale of wind. It is likewise very injurious in the holts and osier-beds where the willow is cultivated for economical purposes. Fig. 1, *a*, *b*, larvæ of *C. Lapathi; c*, pupa; *d*, *e*, perfect beetle.* One of the largest of our native weevils has been convicted of causing similar injuries to the Scotch fir. This is named *Hylobius Abietis*, the generic name referring to the nature of the abode, selected by the larva. The perfect insect is about three quarters of an inch in length, of a pitchy-black colour, the surface variegated with short yellow hairs, for the most part thinly scattered,

Fig. 1.



---

* For all the illustrations of the present paper, except the second, we have been indebted to Mr Loudon of London.

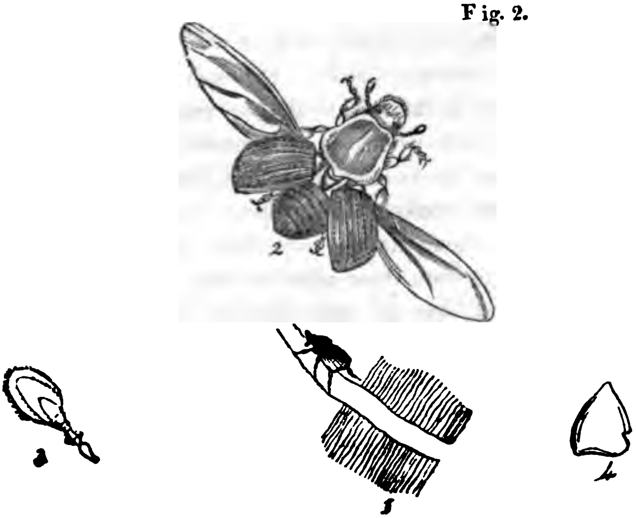
but condensed into two interrupted cross-bands on the elytra, one of them abbreviated and placed obliquely before the middle, the other behind the middle. The insect is plentiful in Scotland, particularly in the vicinity of pine plantations, but gradually becomes scarcer as we advance southwards. It chiefly attacks young plants, and, besides the *Pinus sylvestris*, or Scots fir, it frequently infests the *Abies excelsa*, or spruce fir. Every one who handles the living insect, will be struck with the accuracy of Linnæus's concise description of its manners: "Tardè incedit, arcte apprehendit, tenaciter adhæret, ore frustra cutem mordere tentat captivus."

The insects of the genus *Pissodes*, are so similar to that just described, that they have often been confounded by authors. Their habitat is the same, all of them being attached to species of the pine and fir-tribe. On the Continent, they are often highly prejudicial in young plantations, by perforating the shoots, mining galleries beneath the bark, and excavating cavities in which to undergo their metamorphoses. Such are the habits of *P. pini* and *P. notatus*, which are likewise natives of this country, but of such rare occurrence, that it is unnecessary to enter into their history at greater length, as there is little likelihood that they will ever increase to such a degree as to demand the attention of the forester.

This habit of living in the interior of trees, occasionally observable among the Curculionidæ, leads naturally to the consideration of an allied group, which is so exclusively lignivorous as to have obtained the names of wood-beetles, timber-borers, &c. This is the family named *Bostricidæ* by British authors, and *Xylophagi*, or wood-eaters, by Latreille and other French writers. Their affinity to the weevils appears in the head being slightly elongated, (at least in some of the species,) the antennæ clavate at the extremity, and the body narrow and lengthened. The tarsi also are four-jointed, and the penultimate joint heart-shaped, or bilobed, as among weevils. They constitute, perhaps, the most formidable phalanx of insect enemies which assail our forest-trees, and, notwithstanding their small size, and comparatively insignificant operations when considered individually, such is their destructive power when congregated, as they sometimes are, in countless numbers, that the largest and most healthy trees soon become their victims. Some of them are internal feeders, others are subcortical; and it is perhaps among the latter that the most pernicious kinds are to be found. Their general plan of proceeding, is to scoop out cylindrical galleries in the soft inner bark, which, as well as the woody substance of the tree, constitutes their food. These bores ramify in all directions, without however intersecting each other, or anastomosing, except in rare instances; and the death of the tree is occasioned by being barked, a complete separation being made between the wood and the superficial circulating system by which its growth is maintained. The bores, or tubular paths, sometimes form irregular figures, not unlike some kinds of written characters, or the rivers as delineated on a map; hence such names as polygraphus, micrographus, and typographus have been fancifully conferred on certain of the species. The last mentioned of these, *Tomicus typographus*, is a rare insect in Britain, but it is plentiful in many continental countries, and a brief notice of its proceedings there, will convey a notion of the extensive scale on which these minute agents sometimes carry on their depredations. Their ravages have been long known in Germany under the name of *wurm-trökness* (decay caused by worms), and in the old liturgies of the country, the animal is called the "Turk," a name by which it is vulgarly known. It first appeared in great multitudes in the Hartz pine-forests, in the latter portion of the seventeenth century. It reappeared in 1757; was extremely prevalent in 1769; and reached its maximum of increase in 1783, at which time it was calculated that not fewer than 80,000 sometimes infested a single tree. The number of trees destroyed, was computed at a *million and a half*, and the inhabitants were threatened with ruin from the want of fuel to carry on the mining operations which were once so extensive in that district. Such losses as these may well lead us to make an observation similar to that of the French Academician, when he says, "L'histoire de ces animaux merite d'etre connu, á raison de son extrême importance, de tous les grands proprietaires et surtout par les inspecteurs généraux des nos forêts, et ils verroient combien de causes qui dans le principe ne fixent au moment l'attention, peuvent par negligence devenir funestes à l'etat."

The first insect of this tribe which we shall describe is named *Scolytus destructor.*

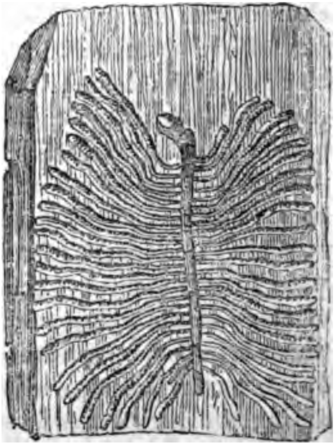
Fig. 2.



As a genus, Scolytus may be distinguished by having nine joints in the antennæ below the club; the latter large, oblong, and compressed, consisting of three closely united plates, No. 3, fig. 2; mandibles strong, obtusely triangular, No. 4; maxillary palpi short and four-jointed, those of the labium three-jointed; body cylindric, the apex of the abdomen obliquely truncated; tarsi four-jointed, the penultimate one divided into two lobes. The species, whose history we are about to detail, is about two and a half lines in length, black and shining; head clothed with short yellowish hairs; thorax large and finely punctured; elytra variable in colour, being sometimes nearly black or pitch-colour, at other times approaching to chestnut, each with seven punctured striæ, the interstices irregularly punctured; abdomen hairy; legs and antennæ dull red. No. 1. the insect nearly of the natural size emerging from one of its bores: 2. a magnified view of the same flying.

Where this insect prevails, it will be found in the perfect state from March to August, either running along the bark of elm trees or flying about in their vicinity, an operation which it performs with more facility than many other beetles, owing to the length and development of its wings. It is during the period mentioned that the female deposites her eggs. For this purpose she mines her way through the external bark till she reach the wood; she then continues her progress between the bark and the wood, generally scooping out her path partly from both, so that when the bark is removed the grooves become visible. On each side of the bore she drops her eggs as she advances, her progress continuing till the whole are laid, when, as if exhausted by the operation, and the grand function of continuing the species having been executed, she makes no further exertion, and may generally be found dead at the extremity of her tube. The larvæ which emerge from these eggs are soft whitish maggots, similar to those of weevils, and entirely destitute of legs. Their sole nutriment is the bark and wood of trees. In eroding these substances, they always proceed forwards, and consequently form tubular galleries, nearly in the same manner as is done by the perfect insect. The arrangement of these galleries is deserving of notice, as evincing a wonderful instinctive provision for the mutual accommodation of the species. If dug indiscriminately in any direction, they would continually interfere with each other, and the operations of the little miners be disturbed; to avoid such a contingency, they branch off at right angles from the path of the parent (that is, from the place where they were hatched), and proceed for a certain length in parallel lines, and then gradually diverge from each other, like radii from the centre of a circle. (See fig. 3.) In this way each is confined to his own premises, and does not interrupt the proceedings of his neighbour. When the brood is very numerous, these lines are so close to each other as effectually to separate the bark from the wood, and of course destroy the vegetative powers of the tree. In ordinary cases, the larvæ continue alive and active throughout the winter,—a season when their mordications are attended with the greatest injury, because there is then no active vegetation tending to counteract them, and the bark

Fig. 3.



is more easily separated from the wood. The change to the pupa state usually takes place early in spring, and the perfect beetles emerge towards the close of that season. This they accomplish in the usual manner by boring through the bark, and the holes thus made, together with those of the larvæ and the ovipositing female, cause the bark to fall off in large pieces.

This insect fortunately appears to be rare in Scotland; indeed we are not aware that it has been observed at all to the north of the Tweed, but our Scottish insects have been so little sought after, that we are not entitled to infer from this that it does not inhabit our elm plantations. It is abundant in many parts of England, and has been so much on the increase, for several years back, in the vicinity of London, as to threaten the entire extirpation of the elm trees in the parks. Its devastations have appeared in Kensington Gardens, Hyde Park, St James's Park, &c., while in Greenwich Park, Camberwell Grove, and elsewhere, many of the finest trees are destroyed annually. The havoc thus produced, excited the regret of all who felt an interest in preserving the beauty of these metropolitan promenades, and with a view to discover some remedy, if possible, for the evil, Lord Sidney, the ranger, once employed Mr Macleay, an eminent natural historian, to draw up a report on the subject for the Treasury. The insects' operations and economy were carefully investigated, but little was discovered which was not previously known from the accounts of former observers. Mr Macleay's attention, therefore, was chiefly directed to the discovery of some means of checking or preventing their ravages. The recommendations he gives with this view, we cannot do better than present in his own words.

"It seems, in the first place, advisable for those persons who have elm trees, in the state of those in the parks, to inspect them twice every year, first in summer when the perfect insect is on the wing; and secondly in winter, when those trees which are much infected ought to be cut down. Such trees ought, if possible, to be burned with the larvæ in them, or if this be not convenient, they should be immediately subjected to such heat or fumigations as may destroy the larvæ, which at this season are near the surface, and therefore not so difficult to kill. To rest content with having cut down the trees, without destroying the larvæ, or even removing the trunks from the vicinity of the sound wood, is, in reality, to do no good at all.

. . . .

"It may also be recommended, that no more elm trees be, during the continuation of the disease, planted in places where it is prevalent. The insect is peculiar to the elm, and was, in all probability, introduced into the parks with some of the young elms which have lately been planted in different parts of them. The other species of trees in these places of public resort seem, on the whole, to be very free from disease; but in planting, and particularly in ornamental planting, it may be well to bear in mind, that indigenous trees are much more subject to the attacks of our indigenous insects than those which are not natives of this country.

"With respect to those trees which are in an unsound state, it is very difficult to point out a cure for them. When the insects attack the branches, these ought obviously to be examined, and if infected, ought, as soon as possible, to be lopped off and burnt. I scarcely know, however, what to propose for the preservation of those trees of which the trunks are infected. Perhaps it may be of use to cover over in the month of March, with a mixture of tar and train oil, to a certain height from the ground, all such trees as it may be thought proper to attempt to save. I venture to recommend this coating of tar, not only by way of experiment, as protecting the trunk from the access of the perfect insect, but for the purpose of filling those little round holes, which, it is easy for an observer in summer to perceive, afford peculiar facilities for the communication of the disease." *

Such is the result of Mr Macleay's inquiries. It was then supposed that the female scolyti deposited their eggs in perfectly healthy trees, and that they were even preferred in that condition as a nidus for the young. Appearances, however, were subsequently observed which seemed opposed to this opinion, and it was at last satisfactorily established, that the eggs and larvæ occur only in diseased trees, or such as exhibit incipient symptoms of decay. So far, therefore, as regards the larvæ, whose excavations are by far the most extensive, trees in a sound state can sustain no injury; but it is to be observed at the same time, that the perfect insects perforate the bark of healthy trees for the purpose of *feeding* upon the liber, and the numerous bores thus formed, by allowing the sap to exude and admitting moisture, may concur with other causes, or may of itself in a few years suffice to induce such a state of disease as may render the tree a fit recipient for the young brood. The discovery of this fact, which we owe to M. Audouin, Professor of Entomology in the Muséum d'Histoire Naturelle of Paris, reconciles the conflicting opinions that the decay of the elms is produced by the insects, and that the larvæ are never found in a tree unless it be previously diseased.

* Edinburgh Philosophical Journal, No. xxi., July 1824, p. 127.

The presence of the larvæ being thus the effect and not the primary cause of disease, it is obvious that as long the trees are in a sound condition they run no risk of being attacked by scolyti, at least in the most destructive stage of their existence,—a much more satisfactory conclusion than that at which Mr Macleay arrived, inasmuch as it suggests a more effectual means of guarding against infection in such trees as are predisposed to it. Even when the old beetles are likely to impair the health of the tree in pursuit of food, a sufficient time must elapse before the injury become great to admit of some remedy being applied. M. Audouin recommends that whenever the presence of these insects is suspected, the exterior rough bark should be pared away with a cooper's spokeshave, or some similar instrument, in order to discover whether there be any furrows in the inner bark. Should such be detected, the next thing to be ascertained is, whether the female has already deposited her eggs, or if the inner bark contain larvæ; in that case it is necessary that the trees should be cut down, the bark peeled off close to the wood, and every fragment of it burned. When the trees have been perforated for food only, and are not inhabited by larvæ, they should be carefully brushed over with coal tar, the smell of which is so offensive to these creatures, that it will in all likelihood deter the females from attempting to effect a lodgement for herself and progeny. A great many young elm trees in the Boulevards at Brussels, which had been brought into an incipient stage of debility by the attacks of scolyti for food, but not yet attacked by the female, were so treated in the spring of 1836, with every prospect of a successful result; although some years must elapse before it can be determined whether it be entirely satisfactory.*

---

* For these particulars relating to M. Audouin's researches, we are indebted to Mr Loudon's *Arboretum et Fruticetum Britannicum*, a work of which it is not easy to say whether it is most remarkable for elegance of execution, practical utility, or encyclopædiac range of information,—to which they were communicated by Mr Spence, the distinguished coadjutor of Mr Kirby. Mr Spence's prolonged residence on the Continent has afforded him opportunities of observing the operations of this insect on a larger scale than can be witnessed in this country, and what he has noticed corroborates M. Audouin's statement. He found the elms in the promenades at Brussels, Dunkirk, Calais, Boulogne sur Mer, Montreuil, Rouen, Havre de Grace, Caen, St Lo, Granville, &c. rapidly falling a prey to this insidious foe.

Only two other species of scolytus occur in Britain, and both seem to be rare. One of them, *S. pygmæus*, is occasionally associated with *S. destructor* beneath the bark of the elm, but its appropriate residence is the oak. Although there is no recorded instance of its ravages in this country, it is abundant so near our southern shores as the Bois de Vincennes, near Paris, where no fewer than 50,000 young oaks had recently to be cut down in consequence of its attacks. The value of the oak in this country is so great, that it is desirable to be acquainted with all its enemies, especially with one which occasionally becomes so formidable. The length of the insect does not exceed a line and a half. It is black, smooth, and shining; the head strong and granulated, the thorax with the anterior margin sometimes reddish; the elytra rust-red, closely punctate-striate, each of the spaces between the striæ marked with a row of minute punctures; abdomen retuse, mucronate in the male; legs pitch-red, the antennæ also red, but of a lighter hue.

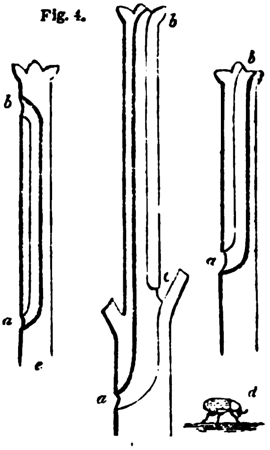
Hylurgus piniperda. The genus Hylurgus has considerable affinity to the preceding, but the species are somewhat different in their economy. It may be recognised by the strongly clubbed, eleven-jointed antennæ, the first joint very long and bent, second globular, third smaller and obconic, four following transverse, the remaining four forming a globular pubescent club; organs of the mouth small, the mandibles triangular and acute, with two teeth on the inner edge; body rather long and cylindric; eyes long and narrow; tibiæ dilated at the apex, and bidentate externally; tarsi five-jointed, the penultimate one bilobed.

The typical or most characteristic species of this group, *H. piniperda*, is nearly two lines in length, of a pitch-black colour (varying in the shade in different individuals), punctured and slightly pubescent; head considerably produced in front, having a short longitudinal ridge in the centre anteriorly; antennæ ferruginous; thorax thickly covered with rounded punctures; elytra cylindric, a little wider than the thorax, roughly punctured, with nine punctured striæ on each; legs pitchy; tarsi light reddish-yellow. Varieties occur entirely of a pale colour; and in some instances the elytra are chestnut-colour or reddish.

As the specific name implies, this insect attaches itself to the pine tribe. In this country it is found chiefly on the Scotch fir, but it is said also to infest the spruce, and it has been known greatly to injure foreign pines introduced into our nurseries, *Pinus ponderosa* for example; but as there are several different kinds of *Hylurgi*, not unlike each other, it is probable that more than one species are concerned in causing these injuries. The proceedings of all of them are precisely similar, but the one described above chiefly merits attention as it is by far the most common and obnoxious; indeed, it abounds in most young plantations of Scotch fir, and must necessarily occasion much loss. Like the scolyti it perforates the bark and wood of the trunk, but the principal damage results from its propensity to attack the terminal shoots. It first bores into these in a horizontal direction, and having reached the centre ascends perpendicularly in a direct line, and emerges at the upper extremity. Its mode of operation will be well understood from the accompanying figures and observations illustrative of its economy, communicated by Dr Lindley to Mr Curtis.

"For the purpose of examining its proceedings more narrowly, I placed a shoot of the Scotch pine under a glass with the insect. In about three hours afterwards, it had just begun to pierce the bark at the base of one of the leaves. Its mandibles seemed chiefly employed, its legs being merely used as a means of fixing itself more firmly. Four hours after, its head and thorax were completely buried in the shoot; and it had thrown out a quantity of wood, which it had reduced to a powder, and which nearly covered the space within the glass. In sixteen hours more, it was entirely concealed, and was beginning to form its perpendicular excavations, and was busily employed in throwing back the wood as it proceeded in destroying it. There were evidently two kinds of this saw-dust, part consisting of shapeless lumps, but the greater portion of very thin semitransparent lamellæ, or rather shavings. I now examined it every day till the fifth, when I found it had emerged through the central buds, at about one inch from where it had first entered."

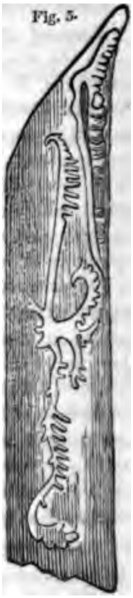
Fig. 4.



The illustrations in fig. 4, represent three sections of shoots of the Scotch fir, with the paths excavated by the insect: *a*, the place where it entered; *b*, the aperture by which it emerged after finishing its excavation; *c*, the end of the first and beginning of a second excavation; *d*, the insect. Several other members of this genus lend their aid in damaging young firs, particularly *H. ater* and *H. angustatus*, two species which appear to be very detrimental in some parts of the Continent, and whose proceedings have been recently described by Dr Ratzeburg.*

Of the genus *Tomicus*, to which we have already alluded as containing insects very prejudicial to forest trees, eleven different species are known to inhabit Britain. Some of these occasionally increase to a hurtful extent in other countries, but as we have never heard them accused of committing much damage here, it is unnecessary to enter at length into their history, more especially as it closely resembles that of the subcortical kinds already given. All of them frequent pines and firs belonging to the genera *Pinus*, *Abies*, and *Larix*, and we may justly say of the whole tribe what the accurate historian of Swedish Coleoptera, Gyllenhall, asserts of one of them—"*pinetorum pestis.*" *T. abietiperda* selects the *Pinus picea*; *T. pinastri*, *Pinus sylvestris*, the Scots fir; *T. laricis*, the *Larix communis*, common larch; *T. bidens*, *Pinus sylvestris*. The two latter of these are natives of Britain, the former having occurred in the vicinity of Windsor, and the latter near London. Fig. 5 represents the general appearance of the tortuous and dentated paths of *T. bidens*, reduced from Ratzeburg's figure. *T. chalcographus*, a foreign species, is sometimes accidentally imported into this country in timber from the Baltic. Mr Spence found it in a living state beneath the bark of a foreign fir-tree, which was preparing at Southampton for a mast. Several of the insects were then (the month of March) just emerging from the pupa, and others were still in the larvæ state. The beetle is about a line in length, pitch-black with reddish elytra, the latter truncate behind, and each furnished with three teeth on the posterior edge.

Fig. 5.



---

* Entomologische Beitrage von D. J. T. C. Ratzeburg. Nova Acta Acad. Cæsariæ Leopoldino-Carolinæ Naturæ Curiosorum, vol. 17.

There is another group belonging to this wood-boring family distinguished by the generic name of *Hylesinus* (from ὕλη, wood, and σινω, I injure) which cannot be omitted in an enumeration of the insect enemies of our forest trees. The species very closely resemble the *Hylurgi*, but they may be readily discriminated by the club of the antennæ being composed of only three joints, and by the short ovate shape of the body. Their tortuous paths are never so extensive as those of the *Scolyti*, and always more insulated; they are besides by no means such prolific insects, and their attacks are consequently less to be dreaded. One of the most common members of this genus, at least in the northern portion of the island, is *H. Fraxini*, which feeds on the ash. The bark may be sometimes observed not a little damaged by its erosions, but we have never seen it so to such an extent as in any degree to affect the general health of the tree. They may, however, become detrimental when the tree is not in great vigour, or when they happen to be combined with other deleterious influences. The insect varies in length from one and three quarters to upwards of two lines. It is of a blackish-brown colour, covered with ashy scales above, and variegated with others of a dusky hue; antennæ rust-red, the club dusky; elytra, indistinctly punctate-striate; under side clothed with ash-grey pubescence; legs pitchy, the tarsi reddish-yellow.

The xylophagous insects hitherto alluded to feed on living wood; but to the same section belongs that well known tribe of beetles which perforate it when dead. It appears to be unsuited to their taste as long as any of the natural juices remain, and the longer it has been in a state of desiccation the more liable is it to their attacks. Hence it is that furniture of every kind, even such as has basked for a century before a fire, becomes their favourite residence, and they often render it totally unfit for any other purposes than their own. "Terebravit et destruxit sedilia mea," is Linnæus's assertion regarding one of the species, and there is ample reason in the present day for renewing the complaint and extending it to others. It is not a little surprising that the fluids indispensable to the existence of an animal body can be elaborated rom materials from which it would be scarcely possible, by any process of artificial chemistry, to extort a single drop of moisture. The insects in question pertain to the family *Ptinidæ*, and are chiefly referable to the genera *Ptinus* and *Anobium*. The former of these has antennæ as long as the body, inserted between the eyes near each other, the joints cylindric and nearly of equal length, except the second, which is short; palpi nearly filiform, thorax narrower than the elytra, hood-shaped and generally contracted behind; elytra nearly oval or subglobose; legs slender, the thighs a little thickened; tarsi consisting of five joints.

Several different kinds of *Ptini* are almost equally plentiful in Britain, but as a description of them all would occupy too much space, we shall merely mention the characteristic marks of *P. Fur*, one of the most troublesome of the fraternity. It is nearly two lines in length, of a dusky reddish-brown colour, the surface covered with short ashy pubescence; thorax so convex in front as to appear nearly globose, having four tufts of hair placed transversely and a longitudinal channel down the middle; elytra oval in the female, nearly linear in the male, with crenated impressed lines, and two interrupted cross bands of white pile, one near the base not extending to the suture, the other behind the middle composed of white spots. Besides frequenting old wood, this species as well as the others is extremely troublesome in museums, and other places where the skins of animals are preserved, as it feeds upon them and riddles them with holes in all directions. The best methods of destroying them are equally applicable to a much more dangerous enemy to preserved specimens of zoology, viz. a small moth, and will be indicated when we come to treat of the latter.

Common as the ptini are in certain localities, they are by no means so plentiful nor so generally distributed as their associates the Anobia. Almost every piece of old dry timber supplies these in abundance, and it is by them that nearly all the circular holes in old furniture are made. These bores are usually about three quarters of a line in diameter; occasionally larger, and not unfrequently less. Their size corresponds to the bodily dimensions of the species by which they are formed; and this, in the far greater number of instances, is

A. striatum. This insect is very abundant in Scotland, and in many places it is the only species that attacks the timber of dwelling-houses. Its colour is dull brown, somewhat pitchy, the thorax hood-shaped, produced into a triangular elevation behind, with an obsolete groove in the centre, and two shallow impressions on each side; the head partially concealed by the thorax; elytra with the sides parallel to each other, rather long, convex, the apex obtusely rounded, the surface closely punctate-striate; under side of the body and legs dull rust-red, with fine pubescence. This little insect was named *A. pertinax* by Fabricius, on account of its *pertinacious* simulation of death.

> "All that has been related of the heroic constancy of American savages when taken and tortured by their enemies, scarcely comes up to that which these little creatures exhibit. You may maim them, pull them limb from limb, roast them alive over a slow fire, but you will not gain your end; not a joint will they move, nor shew, by the least symptom, that they suffer pain. Do not think, however, that I have ever tried these experiments upon them myself, or that I recommend you to do the same."*

Although it is principally by the larvæ that timber is perforated, we seldom observe them in that state, as they then keep themselves deeply ensconced in the interior. The holes on the surface are made by the perfect insects in effecting their escape from their narrow dwellings. It is not till in the enjoyment of daylight and liberty that they choose their mates; and after pairing the female returns to her galleries. The larvæ resemble small, white, soft worms, with six short minute feet. The head is of a harder consistency than the other parts, and is terminated by two jaws in the form of strong cutting pincers, with which they gnaw the wood into the finest sawdust. When about to change into the pupa state, they line the bottom of their little cells with a few silken threads. The superstitious fancy of the *death-watch* has arisen partly from this insect and another member of the genus, common in many places, *A. tesselatum.* They are supposed, however, to share this mysterious calling with *Atropos pulsatorius*, *A. fatedicus*, and probably with several others. According to Dr Shaw, it is in the advanced state of spring that the Anobia (particularly *A. tesselatum*) commence their mysterious pulsation, which he asserts is nothing more than the signal call of the sexes. The number of distinct strokes is generally from seven to eleven, and these are occasioned merely by its beating with its head, with considerable force and quickness, against the plane of its position. When the insects are numerous, as is frequently the case in old houses, these sounds may be heard during the whole day, especially in warm weather. The sound greatly resembles a moderate tapping on a table with the finger nail; and indeed, by that simple process, they may be induced to beat in reply when not otherwise inclined to do so. "He that could eradicate this error," says the quaint Sir Thomas Brown in his *Pseudodoxia Epidemica*, alluding to the death-tick, "from the minds of the people, would save from many a cold sweat the meticulous heads of nurses and grandmothers."*

---

* Introd. to Entom. ii. p. 235.

THOUGHTS ON SUBSOIL PLOUGHING.

A notion of the great efficacy of subsoil ploughing in improving land and increasing the fecundity of crops, has become very prevalent amongst agriculturists. This notion prevails more generally in England than in Scotland. The popularity of this notion in England may be accounted for in this way. When belief in the power of Parliament to relieve agricultural distress was generally entertained by agriculturists prior to 1836, the formation of a Select Committee of the House of Commons in that year to investigate the causes of that distress, and propose remedies for its removal, excited the highest hopes of the agriculturists of England. But when the Committee terminated its labours by presenting voluminous masses of evidence, without any suggestions of remedial measures, those hopes were grievously disappointed. At the time strong doubts were entertained of the sincerity of that Committee, on account of the mode in which it was originally constituted; because it was too evidently concocted for the express purpose of strengthening those adverse opinions which were openly expressed against the truth of the allegations made by the agriculturists regarding their distressed condition. Any thing that emanated from it, either in the shape of evidence or a report, could not therefore carry with it the force of persuasion. A report was submitted to the Committee for adoption by its chairman Mr Shaw Lefevre, but was withdrawn. Mr Shaw Lefevre, however, published the report in the shape of a letter to his constituents in North Hampshire, at the well-chosen time when the curiosity of agriculturists was anxiously excited to learn what the Committee had to say for itself. As might have been expected, the letter caused a great sensation in the agricultural world, when it was ascertained, that it dissuaded agriculturists from looking to Parliament, and advised them to trust to their own exertions for relief by improving their land, which it unequivocally maintained could be best effected by draining and subsoil ploughing. Seeing that Parliament was unwilling to entertain any scheme for their relief, —that it was hopeless to expect that another Committee could be obtained on which they could place more reliance,—that their own prospects were beginning to brighten up after a long period of depression, during which a constant refusal of an investigation into their case was given by the legislature,—the agriculturists, finding themselves entirely thrown upon their own exertions, naturally became willing to adopt any remedy that presented a likelihood of improving their condition. The readiness with which they relinquished their dependence on Parliament, and the eagerness with which they listened to the advantages of improving land, shewed, however, the sincerity of their complaints, and the keenness of their desire to escape from those privations which they had felt during the time they had been petitioners to the legislature. To obtain information regarding those advantages of improvement, the agriculturists eagerly perused Mr Lefevre's letter; and its sentiments on the various topics upon which it descanted, being written in a plausible style, and stated to be in accordance with the evidence that had been given to the Committee, found a favourable reception from them. This representation was no doubt quite true; but it was equally true, that many of those sentiments were both contradicted and modified by the evidence of other witnesses who had also been examined before the Committee; and this point has been clearly demonstrated by Mr Blacker, in his criticisms on Mr Shaw Lefevre's letter. But Mr Shaw Lefevre, by chiefly dwelling upon those portions of the evidence which coincided with his own sentiments, gained the principal object which he, and those who appointed the Agricultural Committee, had all along in view—that of diverting the minds of the agriculturists from Parliament; and, to secure this diversion, he started the fresh hare of the subsoil plough, and set the whole pack of clodhoppers in pursuit of the new game. At least, this is the interpretation we put on the concluding paragraph of his letter at p. 39, in which we think he let out more of his intention than his caution in other respects seemed to justify.

---

* Entomologia Edinensis, p. 217.

> "This remedy is within the farmer's own power; industry and good management on his part, combined with a generous forbearance on the part of his landlord, will produce that result which it is *in vain to seek* (because not in their power to grant) from the Government or the *Legislature*; and *if I can only succeed in convincing you of this one fact, I shall be amply rewarded for the anxious share* which I have had in the labours of the Agricultural Committee."

And no wonder Mr Lefevre succeeded in his object, in laying a scent for the agriculturists, when the unusual means resorted to for distributing the numerous editions of his pamphlet throughout all the agricultural districts of England, are considered; and when the majority of the press, friendly or otherwise to agriculture, and those of them who usually pay little regard to agricultural matters, combined in one chorus to extol the advantages of the subsoil plough. Even yet, almost all the periodical works and papers which are devoted to rural affairs have not ceased to laud and magnify the wonderful benefits to be derived from the use of the subsoil plough.

This incessant chaunting would be a very pleasant and even laudable amusement were it as obviously harmless as it is pleasant. But "let every thing be done decently and in order," is the apostolic rule. Let subsoil ploughing have its due, but let it not usurp the prerogatives of more important operations. We suspect that indiscriminate recommendations of the subsoil plough are more likely to do harm than Mr Lefevre anticipated when he published his sentiments in regard to its efficaciousness. Is *he* so thoroughly acquainted with the working of that implement, as to warrant his indiscriminate recommendations of its use? Is he aware that these evils may arise from such hasty recommendations, namely, the evil of confusing the ideas of those regarding the functions of this implement, who have not experienced the comparative effects of subsoil ploughing and thorough draining? The evil of substituting subsoil ploughing for thorough draining? The evil of subsoil ploughing in circumstances not suited to it? The evil of incurring the expense of purchasing that implement, in cases where subsoil ploughing is unnecessary? Doubtless Mr Shaw Lefevre has not duly considered the natural consequences of those evils, or he would not so confidently have recommended the use of the subsoil plough. In alluding to thorough draining, he justly says at p. 13, that,

> " On the subject of draining, the Agricultural Committee received very interesting evidence both from England and Scotland. In Kent and Sussex, and several other counties, the clay soils have been much improved by the use of Pearson's draining plough. But the system of thorough draining adopted in Scotland is very far superior, and is an improvement well worthy the imitation of English farmers."

This is the truth, and nothing but the truth, regarding the advantages of thorough draining. But in what follows, Mr Shaw Lefevre attributes those "most astonishing effects" to subsoil ploughing which he should have rather ascribed to thorough draining. He seems so enamoured of the subsoil plough, that he almost loses sight of thorough drains. If he, an acute man, displays such confusion of ideas, on treating of these two very different operations, as is manifested in the following extract, what perspicacity can be expected on the subject in a poor farmer? Let him say if thorough draining and deep ploughing cannot produce all these effects?

> " The *most astonishing effects,* however, appear to have been *produced by a new agricultural implement,* the invention of Mr Smith of Deanston, near Stirling, called the subsoil plough. This machine is a *necessary* accompaniment to draining; but when *that* is done effectively, *it* seems calculated *to render the most steril and unproductive soil fertile and profitable.* . . . . Mr Smith's most ingenious invention (which is admirably described in his evidence, to which I beg to refer you for a more complete explanation of its principle) by breaking the subsoil without bringing it to the surface, renders *it pervious both to air and water.* The *same chemical changes* which take place in a *fallow,* owing to its *exposure* to the *action* of the *wind* and *rain,* are thus brought to operation *in the subsoil,* whilst the upper is in the ordinary course of cropping, and when *after a few years,* by a *greater depth* of *ploughing,* the *subsoil* is *mixed*

> with the *upper, it* is found to be so completely *changed* in its *nature* as to be *capable* of producing every description of corn. The *advantages* of *this system* of husbandry are so apparent, that no farmer will be at a loss to appreciate the merit of the invention. I believe it to be quite as *important an improvement* in the management of *clay lands* as the introduction of the turnip system has been with reference to light soils; and as the experiment has been tried for twelve years, and with *uniform success*, I cannot but anticipate its ultimate adoption in those districts of England, where, from the cold retentive nature of the soil, the greatest extent of agricultural distress has hitherto prevailed, and *where draining is essential* to preserve them in a state of cultivation."

For a moment let us forget that there is such a thing as subsoil ploughing, and then let us repeat the question, Cannot thorough draining, with the ploughing up of the subsoil after a few years, confer exactly all those advantages which Mr Shaw Lefevre here solely ascribes to subsoil ploughing? Surely they may, and they *have* conferred them in localities where subsoil ploughing was never practised. Since this is the case, why ascribe to subsoil ploughing effects which *it* never can produce without the aid of thorough draining, whilst thorough draining, along with deep ploughing, has conferred all those benefits without the slightest aid from subsoil ploughing. The inevitable conclusion from these premises is, that thorough draining is the primary, the fundamental, the more useful operation of the two, and yet Mr Shaw Lefevre gravely ascribes "the most astonishing effects" to the use of this new agricultural implement; but when he is anxious to extol it as being "calculated to render the most steril and unproductive soil fertile and profitable," he is obliged to admit that it can only effect that object through the instrumentality of thorough draining when "that is done effectively." This admission in reality deprives the subsoil plough of all its previously extolled merits, and praise of its high merits, in connection with this admission, furnishes a striking instance of that species of perverted argument which ascribes the greater result to the lesser cause. Such an argument originates either in a confusion of ideas concerning the actual properties of thorough draining and subsoil ploughing, or in self-delusion in a favourite subject, or it may proceed from both causes. That Mr Lefevre really labours under some strange delusion regarding the advantages of subsoil ploughing, may be observed from the circumstance of his expressing himself more strongly in its favour than even Mr Smith, in his evidence either before the committee, or in his pamphlet on thorough draining, published by the Messrs Drummond of Stirling. Mr Smith, of course, is naturally favourable to his own contrivance, of which we think he speaks more favourably than it deserves; and, thinking so, we do not admire his subsoil plough any more than we would adopt his theory, or follow his objectionable practice of taking two white crops in succession (qu. 15,167 of the Evidence). With all his predilection for the subsoil plough, had this direct question been put to him by the committee, If he thought it impossible to improve land to the highest degree of fertility without subsoil ploughing, he knows farming better than to have answered it in the affirmative; whereas had the same question been put to him in reference to thorough draining, he would at once have given an affirmative answer. He therefore justly deprecates subsoil ploughing as a mischievous operation, without the preparation of thorough draining. Thus, to query 15,170, " Have you used your subsoil plough without any auxiliary permanent drains?" he answers,

" I have, and it is the *worst thing possible* to deep plough land without having it first drained; and it is upon that ground that in England, the shallow ploughing is so much resorted to; the deeper stiff clay is ploughed the worse it is, because there is thereby a greater reservoir formed to hold water." 15,171. " Supposing the instance of a marsh, where you have no fall of water, and you have about eight or nine inches of soil upon the surface that is marl, and underneath you come to a stiff substratum of clay, and it is almost impossible to get water off, the fields are separated by drains, and scarcely any fall for the water, would you then recommend your subsoil plough? Certainly not: I think it would just make a reservoir for more water to lodge." Again, in his pamphlet on thorough draining, in a foot-note at the bottom of p. 20, he intimates, that " I have been often asked if I would recommend subsoil ploughing of land which had not been drained? To this I answer, certainly not; for until there is an escape for the water through the subsoil, any opening of it but provides a greater space for holding water, and will rather tend to injure than improve the soil." . . . . . " So soon as wet lands are thoroughly drained, deep ploughing *may follow* with the greater advantage, but *not sooner.*"

Subsoil ploughing is thus positively a mischievous operation unaccompanied with thorough draining; and yet Mr Shaw Lefevre does not mention this important and candid admission and opinion of Mr Smith, but by his encomiums on subsoil ploughing, rather induces the English farmer to belief in its paramount importance, and leaves the reader to conclude, that though trench-ploughing is inimical to thin clay lands on retentive subsoils, subsoil ploughing is commendable, notwithstanding that Mr Smith had condemned before the committee subsoil ploughing stiff land, without the preparation of thorough draining, as "the worst thing possible." Thus, having good authority for believing that without thorough draining, subsoil ploughing is a mischievous operation, we may also safely believe that with it subsoil ploughing is a very innocent operation, so innocuous as to do as little good as harm.

The theory broached by Mr Smith, and readily adopted by Mr Shaw Lefevre, that subsoil ploughed with the subsoil plough remains ever after friable, and is so maintained and accelerated by the action of the water and the action of the atmosphere, which is constantly going like a tide into and out of the soil (qu. 14,998), admits of doubtful acceptance from its improbability. It is a well ascertained physical fact, that water percolating through any state of soil has a tendency to consolidate it, and especially it will most easily consolidate friable soil. Pour water upon loose sand, and observe how firm the sand immediately becomes. Observe how easily a fine barley-seed furrow is consolidated by a shower of rain. Perceive how firm the soil becomes over a deep drain. These being natural effects produced by natural causes, what is to prevent the consolidation of subsoil by the percolation of water, although it had been loosened by the subsoil plough, especially when placed under a superincumbent weight of earth? Clay soil having a natural affinity for water, its texture does not *clap* or consolidate so obviously by the action of water as friable soil, though it *poaches* on the surface much more readily. Air is found in the earth at the lowest depths, but that its action can be *so* sensible on loosened subsoil, placed under a thick stratum of earth, as to admit of a comparison with *those* chemical changes which it effects on the surface of the soil in fallow, "owing to its *exposure* to the action of the wind and rain," especially when the essential ameliorating element of light is necessarily excluded from the subsoil, is a proposition to which few scientific minds would give assent.

Subsoil ploughing is surely not "applicable to all qualities of subsoil." (qu. 15,154.) What could it effect on a subsoil of trap, of which there are numerous instances in this country and Ireland? There are subsoils both alluvial and diluvial, so occupied with erratic blocks, as to render the admission of any kind of plough impracticable. Those in some parts of Kincardine and Aberdeenshires, and the county of Antrim in Ireland, is so full of primitive and trap blocks, as to form a sort of causeway under the arable soil. The subsoil of gravelly deposites is frequently full of large and land-fast blocks of stratified rock.

From fourteen to sixteen inches under the surface is the depth recommended by Mr Smith for subsoil ploughing (qu. 14,992), and six inches of earth is thought desirable to be between the sole of the plough and the tiles (qu. 15,222), the depth to the tiles thus being 22 inches; but there are many persons who make their tile drains only 24 inches in depth, in which cases, were they to practise subsoil ploughing as here recommended, they would inevitably destroy their drains. It would, of course, be foolish to make the attempt, and yet the probability of such attempts being made by inconsiderate persons, shews the imminent danger of recommending the indiscriminate use of the subsoil plough. Subsoil ploughing is like an edged tool, which is only safe in the hands of an *experienced* operator. If depth of *soil* is all that is desired to be obtained by subsoil ploughing, that object may be *more easily* and *effectively obtained* by ploughing a little deeper than usual with the common, or with a four-horse plough. This implement is more *easily* drawn than a subsoil plough, inasmuch as it chiefly works in the surface soil; and a deep *arable* soil is more effectually procured by it, in a shorter period of time, inasmuch as it brings some of the subsoil, of whatever quality it may be, "as in fallow," to more thorough "exposure to the action of the wind and rain" and light, than can be done by the subsoil plough with its once repeated subterranean operation. Some farmers, it is true, object to bringing to the surface any species of subsoil, as being deleterious to vegetation. This objection has no validity in any case where the soil and subsoil have been thorough drained, and it is less valid in cases where the subsoil is nearly similar to the surface soil, as carse clays, black mould, loams, and such like. But however *tilly* the subsoil is, when mixed in a small proportion at a time, in comparison with the arable soil, after being exposed to the meliorating influence of the light and air, can never materially injure vegetation. But for our parts, we see no necessity for wishing an inordinate depth of workable soil. Six inches form a fair average furrow depth; and if there is as much below it of *well dressed soil*, plenty of scope will be afforded for the rumination of the roots of the plants usually cultivated. We consider the quality or heart of the soil beyond the depth of the usual plough furrow, of much more importance than its quantity; and, of course, six inches of subsoil is much more easily put in heart than sixteen. We have ploughed deep black mould, resting upon retentive clay, sixteen and ten inches deep, at different parts of the same field, with a four-horse plough, after it had been drained, and we could perceive no advantage on the crops for years after, on the deeper portion. Most of the plants which are cultivated in the fields, being fibrous rooted, do not require great depth of soil to thrive in. We have, indeed, traced the root of broad red clover, six feet in depth, through a fissure in a bank of clay loam, which had been carried away by the irruption of a rapid stream in time of flood, but the plant which sent forth this long foraging root was no larger than its neighbours. We have followed the tap-root of a wheat plant for a foot through the soil, but its produce was not greater than that of others around it. These facts are not marvellous, because, had the energies of those plants which were exerted in the prolongation of root, been directed to the formation of leaves or seeds, their products would have been more valuable. It was the scantiness of food that impelled them to roam abroad in search of it. Had they found abundance of food around their roots, like abundantly fed fowls, they would have had no temptation to wander so far from home.

Whilst expressing our convictions on the inutility of subsoil ploughing, we have been frequently interrogated would you not break the *pan* that is below? Break it up and bring it to the surface by all means, if it is within reach of common ploughing, whether the land has been thorough drained or not. But all this apprehension of the moorband pan is founded on an erroneous conception of its origin. How does it originate? It is never found in subsoils of pure clay, of black mould, of hazel loams, of sand or gravel. It is quite impossible it should be found in such situations. The pan or crust is a deposition of iron, and can only be deposited on such subsoils as admit of a certain degree of percolation of water, but not faster than the water may have time to deposite the iron. Hence the pan or crust is only found on subsoils of clay having gravel embedded in them. It is quite obvious from the nature of the deposition, that were there quick absorption of the water, or, in other words, were the subsoil thorough drained, there would be no deposition of pan. The iron in the pan is in a state of hydrate, is soluble, and of course injurious to vegetation; but when this hydrate becomes dry, by exposure to the action of the air, it is converted into a pure oxide, which is insoluble, therefore innocuous to vegetation, and which generally mixes with, and forms a component part and colouring matter of, the soil. The most rational method, therefore, of getting quit of pan is to render the soil thoroughly dry; and any other method is only a temporary expedient. But after all, the extent of peculiar subsoil which can generate pan must be comparatively small, and is chiefly to be met with under peaty earth in moorland districts.

It is desirable that farmers, particularly small farmers, should incur no more expense in the purchase of implements than what is absolutely necessary for the right management of their farms. But, independently of this circumstance, many small farmers have not two pairs of horses of sufficient strength to work a subsoil plough. We know those who have tried it and could not succeed to work it with fewer than three pairs of horses. It is said that the Muirkirk subsoil plough is more easily worked than Mr Smith's, but whether it does its work better or not, which is the chief criterion of excellence, we do not pretend to decide. There is another consideration which is not unworthy of notice, in reference to any extraordinarily heavy work to be performed on a farm. We may propound it as an axiom in horse labour, that every kind of work which requires more than the combined efforts of two horses to execute, is injurious to the horses themselves. When more are yoked together, there is so much counteraction in performing work, that the weak and sanguine tempered horse is always in the end sure to suffer. By using the four-horse plough much in bringing in land, trench ploughing, splitting down old dykes of turf, and tearing up old decayed tree roots, two very powerful horses of our own, both of sanguine temperament, suffered so severely as to superinduce inflammation in the lungs that terminated in helpless broken wind, and so became unfit for ordinary farm work. We afterwards tried to execute much of the roughest part of that kind of work by trenching with the spade, and found it much more cheaply done, taking into account its at once finished effectiveness. Deep ploughing cannot, of course, be executed, in present circumstances, otherwise than with horses; but it is the easiest kind of hard labour they undertake; and two strong horses will turn over a deep furrow of thorough drained land, and four horses a furrow of sufficient depth for every purpose of culture.

But the greatest evil which we apprehend to have arisen from the hasty recommendations of Mr Shaw Lefevre, is, that reliance on his statements may induce farmers in England to substitute subsoil ploughing for thorough draining. Comparatively, subsoil ploughing is a much more economical operation than thorough draining, and this temptation may, in the estimation of those who know little of either, but by name, cast the die in favour of subsoil ploughing. As it is hardly possible to estimate too highly the advantages of dry and deep land, so it is equally impossible to estimate the mischief that may be entailed on land, that has been subsoil ploughed, without being previously thorough drained. From the consequences of this mischief, Mr Smith should be entirely exonerated; for he has earnestly exclaimed, both before the Agricultural Committee, and of course, before Mr Lefevre himself, and publicly in his pamphlet against this "worst possible" practice. Already, however, "the plague has begun,"—too many have already endeavoured to render their land dry by subsoil ploughing; and the heavier the land, they seem the more desirous to practise it, that is, in Mr Smith's words, to form "thereby a greater reservoir to hold water." We regret to observe, that some of the most influential Agricultural Societies in England are in the fair way of propagating this plague. The English Agricultural Society has offered a large premium, for 1840, " for the most *satisfactory*" (where will that be found ?) " application of the subsoil plough to the *improvement* of land, whether for the purpose of *correcting excessive moisture*, or dryness of soil ;" and to shew that the intention of this premium is not to discourage improvement on land previously thorough drained, the third condition of competition requires to be given, " An account of the drains *cut* (*if any*), their depth, and distance from each other." The Prudhoe premium of the Northumberland Agricultural Society, for subsoil ploughing, we observe, was awarded to Mr Cairns of Meldon, in October last, for having subsoil ploughed fifty-four acres, the " most extensively and successfully " of any tenant. Whether the necessary condition of thorough draining is attached to this premium, or whether there were more competitors than Mr Cairns, and the more the worse without such a condition, the printed accounts do not specify. We fear no such wise condition exists, as we never heard of Mr Cairns as a thorough drainer, though his neighbour Mr Scott of Beal deservedly stands very high in that class of true and substantial improvers.

Our creed on the subjects of thorough draining and subsoil ploughing, to which we not only intend religiously to adhere, but to inculcate at every favourable opportunity, we shall here repeat, in the words of Mr Smith, from his pamphlet, at p. 21. " Thorough draining is the *foundation* of all *good* husbandry, and when combined with *deep-ploughing* " (mind *deep*-ploughing, *not subsoil* ploughing, for deep-ploughing *can* be practised *without that*) " insures a general and uniform fertility, assisted, no doubt, by those *essentials*, thorough working and cleansing, ample manuring, and a proper rotation of cropping."

AGRICULTURAL CHEMISTRY. NO. III.*

By HENRY R. MADDEN, Esq., L. R. C. S., Edinburgh.

From the remarks we have made on vegetable nutrition, I am sure it must appear self-evident to all, that the action of the " *permanent*" constituents of soil, namely, *silica*, *alumina*,

---

* In No. 2. of this series, p. 227, line 11, *delete* (common salt) *after* carbonate of soda.

carbonate of lime, &c., must be purely mechanical; and that it is the *organic* matter only, which is added to the soil, that can have any physiological or chemical influence upon vegetation. It is clear, therefore, that the success of all farming operations will in a great measure depend upon requisite attention being paid to the supply of these "*transient*" ingredients, as they have very properly been denominated. Nevertheless, it is absolutely necessary that the proper texture of the soil should be continually preserved, which can only be done by having constant recourse to various mechanical operations, which have from time immemorial been used for this purpose. These may be advantageously divided into two classes. *First*, those which are employed to *alter* the natural texture or condition of the soil, as *draining*, *paring and burning*, &c.; and, *secondly*, those by which the natural texture is *restored*, after it has been altered by the various processes which have been carried on in the soil, as *ploughing*, *harrowing*, &c. We shall now, therefore, say a few words with regard to the theory of these operations. First, with regard to *draining*. That certain plants only can grow in soil which is constantly wet and boggy, is a fact that must be known to all those who have taken the trouble to look about them; and to such it must be equally evident, that the plants which *do* generally inhabit such situations, are far from being the most useful. To grow those vegetables, therefore, which are most prized by the agriculturist, the very first point to be examined into is the condition of the land with respect to *water;* without due attention to which, no soil, however well constituted in other respects, will be found capable of being cultivated by any means to the greatest advantage. When a farmer, therefore, intends to bring any new piece of ground into cultivation, he must first examine its natural herbage; and to one who has any knowledge of "country matters," this will be quite sufficient, since the general character and appearance of the sward of a wet soil is so distinct, that it is impossible to mistake it. For example, wherever the grass is coarse, interspersed with *rushes* and *carices*, we may conclude that the soil is wet, and that the water it contains is frequently stagnant; if, however, these symptoms are not very evident, the farmer must proceed further,—let him see if the herbage is the same in all parts of the field, or whether it is coarser in some places than in others; should this be the case, let him next determine the position of the coarser parts, whether they occur on the rising ground or in hollows. Should the latter be their prevailing position, more particularly should the grass of *all* the lower parts of the fields appear to be in a less thriving state than that on the more elevated portions, there will be good reason to believe that it is owing to some defect in the texture either of the soil or subsoil, by which the water that naturally falls on it is prevented from getting easily away. Again, should any spot shew evidence of moisture, that should at once be examined, and its cause if possible ascertained, more particularly as to whether it depends upon the existence of a spring,—since it frequently happens that soil, which of itself is of the very best texture, may be rendered bad, and nearly useless, by such an occurrence. When the fact is once ascertained, there is no want of remedies. Draining has, I am happy to say, attracted so much attention of late, that it is now brought to a very fair degree of perfection,—in fact, the difficulty is not how to *drain*, but how to *persuade* the farmers and landlords to have their fields drained; for, strange as it may appear, still it is "*not less strange than true*," there are many farmers who are so devoted to their old ways, that, although they cannot look around them without the practical advantages of draining being presented to their eye, still they are content to grow rushes instead of grass, rather than be at the first expense of having their land rendered permanently fertile; by which means, instead of annually losing the rent of such land, they would be receiving a large profit upon the outlay which was necessary to effect the cure.

On account of so much having been already written in this Journal upon the principles and practice of draining, I shall not occupy my limited space with a recapitulation of the various methods of performing this valuable operation, but shall merely, in the briefest manner possible, give an outline of the scientific principles upon which it is founded.

The fundamental law upon which the success of all draining operations depends is simply this,—that water, in common with all other *fluids, cannot support itself in an inclined position*, but will always endeavour to obtain a horizontal one, unless opposed by insurmountable obstacles; hence, so long as the surface upon which water rests is in the slightest degree inclined, it will continue to move onwards. All, therefore, which is required to be done, in order that land should be thoroughly drained, is to ensure a permanent *oblique* channel for the water, the lower end of which must of course ultimately terminate in some proper receptacle, as a pond, river, or the like. In securing this channel, there are various circumstances to be considered, the neglect of any of which will inevitably produce a failure: These are—

I. From whence does the water proceed, from above or below? Or, in other words, is the moisture owing to *retained* surface water, or *emitted* spring water? 2. The texture of the soil must be particularly attended to. If it be a stiff clay, and the cause of the damage *surface water*, the first thing to be done is, by constant tillage, to render the clay as loose as possible,—to raise the land in ridges, and to *furrow-drain*, as it is termed. If, again, the clay is of a lighter kind, as a good *clay-loam*, for example,—or, still more, if the soil be sandy, the subsoil likewise possessing an open texture, the fault will almost invariably depend upon the existence of a spring; in this case, the highest parts of the land should always be drained first, as it sometimes happens that this effectually cures the evil without incurring the expense of draining the whole. There are other cases, however, in which, without an intimate knowledge of geology, it would be useless to attempt draining; for example, in those perplexing instances where the *subsoil* consists of irregular strata of *clay* and *sand*. Many other cases, too, might be mentioned, all of which prove that, to practise draining successfully, a man must make it his chief study, and, depend upon it, it will always, in such cases, be found more economical in the end for farmers to employ a professional drainer, than for them to run the risk of a failure, by attempting it themselves. Before concluding this subject, I may just enumerate the cases in which draining may be required.

I. *To get rid of Surface Water.*—1. In all stiff horizontal clays.

2. In horizontal lands of all textures, if reposing on a subsoil of impervious clay.

3. In ferruginous soils of any texture, where there exists

the *moor-pan*, as it is termed,—by which is meant a peculiar impervious stratum, composed chiefly of iron, which often exists between the soil and subsoil in such situations. Here, however, the breaking of the pan might greatly assist the subsequent draining of the land.

II. *To get rid of Springs.*—Wherever these exist, it is clear that the only way to prevent them injuring the land, is by giving their contents a free exit, in some direction where they can do no harm.

Paring and Burning.—This operation is recommended by several writers as the readiest way of bringing many kinds of waste land into a fit state for immediate cultivation; and yet there is no process upon which the opinion of different scientific men appears to be more at variance,—some strongly opposing it as an unwarrantable waste of manure, and others as strenuously recommending it on the score of economy! It is evident, therefore, that one or other of these two sects must either be guided by erroneous principles, or neither of them have sufficiently investigated into *all* the particulars of the subject upon which they have written. The latter of these, I think, we shall be able to prove to be the cause of this, as of many other cases, in which directly opposite opinions are held by different men upon the same subject. We shall, therefore, carefully discuss the point under the two following heads.

First, We shall state the different theories which have been propounded to explain the action of this process, and mention the various ways in which it may possibly act; and, *secondly*, See how and in what cases it may be advantageously applied to practice. The various theories which have been promulgated with reference to this subject are chiefly the following, namely, 1*st*, That it acts by altering the texture of the soil; 2*d*, That its action depends upon the heat decomposing inert vegetable matter; 3*d*, That the cause of the improvement depends upon the formation of *vegetable alkali (carbonate of potass)* which acts as manure; and, 4*th*, That the good effects are caused by the destruction of certain injurious substances which previously existed in the soil. The first of these theories is the one proposed by Sir Humphrey Davy, and has certainly the merit of being founded upon strictly scientific principles: for example, he states that it is injurious except upon clayey soils, but that, in the latter case, the effect of the heat is to alter the constitution of these soils—in fact, to render them in texture much more similar to sands; to use his own words, "It may, when judiciously applied, convert a matter which was stiff, damp, and, in consequence, cold, into one powdery, dry, and warm, and much more proper as a bed for vegetable life." Now that this statement concerning the alteration of texture is strictly true, needs no other proof than a reference to the process of brick-making, which essentially depends upon the above fact. If, for example, we powder a brick, we shall find that, in this state, the clay possesses properties extremely similar to those of sand, namely, that when mixed with water its particles do not adhere together, and form a cohesive plastic mass. The chemical change which it has undergone is simply its being deprived of water, and, as I stated in my first paper, "dry alumina cannot be made to unite with water, except through the medium of chemical solvents:" so that, having once completely deprived it of that substance, there is extremely little chance of its ever resuming the form of a *hydrate.* Moreover, during the process of burning, the alumina enters into chemical union with the silica and iron of the soil, should any exist, and forms with them *insoluble* compounds, which are decomposed with great difficulty; and hence it may be extremely useful in lands where the iron is liable to become soluble, in which state, as before mentioned, it acts as a powerful poison to almost all vegetables. An objection might here be raised, that although paring and burning altered the texture of the soil actually exposed to the fire, still this quantity would be too small, when spread and mixed with the remainder, to produce any material difference of texture; but, upon calculation, it will be found, that, even if the turf lost one-half of its weight by burning—which could only take place when a large quantity of vegetable matter was present—as it is generally cut two or more inches thick, there would be added at least $14\frac{2}{7}$ per cent. of altered alumina (having the *mechanical* properties of silica) to the soil; six inches being taken as the average depth of tillage.

Sir Humphrey Davy likewise takes notice of the second method by which paring and burning might be useful, namely, by decomposing inert vegetable matter. He says, "Although it destroys animal and vegetable matter, nevertheless this is more than compensated by the good it effects upon the texture, and, in fact, the *carbon of the ashes may be more useful than the original vegetable fibre*." Here, however, it is not so easy fully to comprehend the author's meaning; for we have already seen that, in order for any substance to be absorbed by plants, it must either be soluble in water, or in an extremely minute state of division; whereas *carbon*, when fully developed, or, in other words, when completely disorganized, is capable of being dissolved by no known agent except fire; and as to a spontaneous formation of *carbonic acid*, by a union taking place between it and oxygen in the cold, if such is the case, it certainly is a new chemical fact; and, lastly, very little, if any, of the *carbon* left after the incineration of turf will be in a sufficiently minute state of division to admit of its being absorbed in the solid form. The good effects, however, may depend on the burning acting in the following way upon the inert vegetable fibre of soil. Although a great part of the organic matter must be completely disorganized by the intensity of the heat, still a portion of it may not suffer decomposition to the same extent, and this, when acted upon by the *carbonate of potass*, produced during the process, may be easily converted into *soluble organic* food, which, of course, would act as manure: moreover, it is very well known that an accumulation of undecomposed vegetable fibre is injurious to plants; in fact, is one of the most frequent causes of "*loss of heart*" in old pasture land, so that its destruction might be beneficial.

Thirdly, The utility of the process being dependent upon the formation of *carbonate of potass* has already been shewn: in calcareous soils, there would moreover be formed, in addition, a certain quantity of "*hot lime*," which of course would act in the same manner as if applied after it had been burned in the kiln. The great objection which has been made to the process of paring and burning will be best considered here, as it is this "waste of organic matter" that is so severely reprobated. Those who hold this opinion state that the quantity of alkali which is formed is by no means sufficient to compensate for the immense loss sustained by the large quantity of organic matter which is necessarily destroyed during the process; and in its place they propose paring the land, and forming the part removed into compost heaps, in order to be decomposed by means of lime. That this might possibly be applicable in a few cases there can be no doubt; but to adopt it as a general principle would be extremely dangerous; for I fear that, practically, it would be the very reverse of economical; for, when the price of the lime, the expense of making the heaps, and all the other minutiæ, are taken into consideration, it will be found that, in fact, such a procedure would be attended with far more expense than would be compensated by the quantity of manure gained. I have heard a remark by a very sagacious farmer, which I think will apply extremely well here, namely, that, "in the management of a farm, there is a certain point, beyond which if a man goes he will find himself a loser instead of a gainer; for it will never answer to keep a market-farm like a garden." So also there are many things, which, when considered abstractedly, might appear economical, when put into practice would be found to be exactly the reverse.

The last method in which paring and burning has been supposed to act, is that promulgated by Professor Rennie: according to his hypothesis, the advantage derived from this process depends chiefly upon the heat decomposing certain pernicious matters contained in the soil. This statement was made on account of the importance that has been attached by many late writers to some experiments performed some years ago by M. Macaire, by which he endeavoured to prove that plants ejected from their roots substances which were injurious to them, or, in other words, that plants passed *excrementitious* matters into the soil. By this means they have accounted for the necessity of a rotation of crops, and many other circumstances, the causes of which had before been wrapped in obscurity. Now, whatever may be the merits of this theory—and we shall have an opportunity of discussing it fully when speaking of the rotation of crops—it, like all others, has been made use of, by some at least, to explain almost every operation in husbandry: for example, Professor Rennie would have us believe that the chief if not the only beneficial effects to be derived from the various operations of paring and burning, fallowing, irrigation, and the like, depended upon their freeing the soil from this *excrement*. These, with the exception of the first, will be considered afterwards; we shall, however, here make a few remarks upon how far the effects of paring and burning can be explained upon this hypothesis. One of the chief arguments which he adduces in support of this statement, namely, that it is not the formation of ashes, and their action as manure, which is the cause of the improvement, but that the whole amelioration depends upon the decomposition of excrementitious matters—is, that when fires have been lighted upon grass, the sward is afterwards most luxuriant for a certain distance round the spot occupied by the burning mass, or, " in other words, as far as the heat of the fire has been sufficient to decompose the excrement." Now a moment's consideration will, I think, be sufficient to shew the fallacy of this argument. First, Is it likely that the spot itself on which the fire stood should have a luxuriant herbage, when every root and seed contained in the soil must have been completely destroyed by the intense heat? And again, how is it possible that the heat could be sufficient to decompose the *excrement* (an *organic* compound) for *some distance* round the spot, and yet that the roots of the grass (*organized* bodies likewise) should not be in the least degree injured? Moreover, although this alone would be sufficient to shew the instability of the argument—the fact related by no means proves that it is not the effect of the ashes of the plants burned; for, since the active part of these ashes is extremely soluble, the very first rain would carry it into the soil, and unless it were either extremely loose. or perfectly horizontal, a portion of it would most certainly spread for *some distance* round the spot, and hence the increased luxuriance. So much for all the theories which have been deduced as explanatory of this process. We shall now shortly recapitulate the various methods in which it may possibly act.

1. In stiff clays, paring and burning may be of value, by depriving a certain portion of alumina of its *chemically combined water*, thus giving to it the mechanical properties of sand, and hence to a certain extent altering the texture of the soil.

2. In cases where iron exists in the soil, which is liable to become soluble, this process may act beneficially, by causing a

chemical union to take place between this substance and the alumina, and silica, and thus rendering it incapable of being again dissolved; and in this manner doing away with one cause of "*loss of heart.*"

3. By destroying a large quantity of inert vegetable matter, the land may be greatly *cleaned* and improved; by which means another cause of "*loss of heart*" is overcome.

4. By the formation of alkaline ashes (carbonate of potass), and the subsequent action of these upon the remaining organic matters of the soil; thus converting them into *soluble* food.

5. In calcareous soils the chalk will be reduced to lime, thus increasing the quantity of alkali found in this particular instance, the subsequent effects of which will of course be the same as in the preceding case.

6. By destroying the seeds of useless plants, and at the same time most probably the larvæ of innumerable injurious insects.

7. The process of paring and burning being of course followed by ploughing, the land will thus be thoroughly stirred up, and fully prepared for the subsequent operations of husbandry.

Thus we have at least seven excellent reasons in favour of this operation, and only one against it, which we have already seen to be in a great measure futile. We shall proceed therefore to say a few words in reference to its practical application. These remarks will require to be indeed very brief, since it is clear that what has been already said concerning the methods in which the process may act, will at once suggest to the *thinking* farmer the cases in which it may be applicable. I shall merely, therefore, take this opportunity of remarking how impossible it is to lay down practical rules upon any one operation in husbandry, which can be applicable to all cases; in fact, I am convinced that the chief cause of practical agriculturists not giving in to the suggestions of men of science, is, that the latter are so extremely apt to lay down general rules, without at first considering carefully all the various circumstances, local or individual, which may influence greatly the feasibility of the plan proposed. For example, with reference to the suggestion of making compost heaps after paring, instead of burning the mass, the following circumstances would have to be carefully considered,—*1st*, Whether there is a scarcity of manure, and consequently that great care must be taken to husband all that can be got at; *2d*, Whether lime can be obtained with facility, and at a trifling expense; *3d*, Whether on examination the soil is not already full of calcareous matter; *4th*, Whether the trouble and expense of carting the lime, making the heaps, turning them, and allowing the land to lie useless until the compost is fully formed, will be compensated for by the value of the manure gained. Without due attention to all these circumstances the farmer would very possibly find in the end that he was a loser instead of a gainer, and that, in endeavouring to carry his economy to the greatest possible extent, he had, in point of fact, greatly increased his expense. Thus we see that paring and burning is the easiest, quickest, and most economical way of bringing poor cold clays into a fit state for cropping, particularly if stocked with undecomposed vegetable matter, unless under the peculiar circumstances above mentioned; and that likewise it may be useful for sandy soils, should these be liable to "*loss of heart*," either from the existence of iron in a soluble state, or, as in the former case, from the accumulation of vegetable fibre, more particularly if the soil has already a sufficiency of lime; but should this not be the case, unless lime were expensive, it should be tried first, as in many cases it will be found the most economical. The above methods are those chiefly in use for altering the natural texture of soils, and, as has been shewn, are extremely useful for that purpose. In addition to these, however, there has been a great deal said of late concerning the judicious admixture of soils in order to improve their fertility, as, for example, adding clay to sand, and *vice versa*. Now, however plausible these suggestions may at first sight appear, it is very doubtful whether they will ever prove of any great practical value; for there are such a variety of collateral circumstances to be taken into consideration, that it is difficult to see how they could possibly be put in practice, without incurring a much greater outlay of capital than the increased fertility of the soil would ever recompense; for, when we consider the immense quantity of sand or clay, as the case might be, which would be necessary to effect the requisite alteration of texture,*—when we calculate the time and expense of digging, carting, and spreading the soil,—the repeated tillings requisite to mix it properly,—and, moreover, when we consider that, unless the soil added were *surface*-soil (which could extremely seldom be the case), we are adding so much inert mineral matter, which will necessarily impoverish the original soil to a great degree, and hence require large quantities of manure to be added ;—when, I repeat, we take these and many other circumstances into consideration, I conceive that, however plausible the idea of an artificial mixture of soils may be in theory, it will not, in the present state of husbandry at least, be found applicable to practice in any instance where economy is a consideration.

We shall now proceed to consider the various methods which are had recourse to by farmers, in order to *restore* the natural texture to soil, after that has been altered by the various processes which have been carried on in it.†

When earth has been for a long period exposed to the weather, however well pulverized it may have been at first, it will—unless it consist almost entirely of siliceous matter—become consolidated to a greater or less extent, and thus be rendered unfit for many of the operations of husbandry. Moreover, if, in addition to mere exposure, the soil should have had an abundance of vegetation upon it, the root fibres of all these plants will of course remain in it, and thus tend in a still greater degree to bind it together. To obviate these difficulties, as well as to facilitate various other processes, farmers have, from time immemorial, had recourse to various mechanical operations for restoring the soil to its original state: these are *ploughing*, *harrowing*, and the like, by means of which the earth is fully broken up, the root-fibres which it contains completely separated, and the soil thus reduced to a comparatively fine powder. This preparation of soil, of course, differs in degree according to the foulness of the land; for example, much more preparation is requisite after a *grain* than a *fallow* crop, and for this obvious reason, that the latter is in most cases entirely removed from the soil, roots and all, whereas in the former case the root is almost invariably left behind: grain crops, too, from not permitting of hoeing, &c. during their growth, tend greatly to promote the increase of weeds, on which account a longer and more careful cleaning is of course rendered necessary. In a slight sketch of the science of farming, like the present, it would of course be quite out of place to enter into any of the minutiæ of practice connected with the mere *mechanical* operations of husbandry. A very few words will therefore suffice on the subject of *ploughing and harrowing*.

---

* About $120\frac{3}{4}$ cubic yards of earth would be required to cover each English acre, one inch thick, which, as before stated, taking six inches as the average depth of tillage, would, when thoroughly mixed, only add $14\frac{2}{7}$ per cent. of sand or clay to the soil. This shews in a forcible light the practical advantages of paring and burning, over artificial admixture in all cases where the texture of the soil is too stiff.

† Of course these remarks refer only to land which has already been subjected to cultivation, since it is evident that soil which has never been broken up for agricultural purposes must have remained for so great a length of time in grass, or some such state, that this may legitimately be termed its natural condition; and consequently pulverizing such soils may be considered as *altering* their texture.

These operations, as before mentioned, are had continual recourse to by the farmer, in order to keep his land *clean* and *open*, and at the same time render it fit for the reception of seed; and the principles upon which they act are purely mechanical, the plough being merely a modification of the spade, so as to admit of the substitution of *draught* for *manual* labour; and the harrow again merely a horse-rake. It will be, therefore, quite superfluous to occupy any space in explaining the principles of such well known operations.

Not so, however, with regard to the various kinds of *fallowing*, which are used by farmers as aids to ploughing, &c. in cleaning and preparing their land; for here a great many circumstances require attention, all of which must be examined scientifically. *Fallowing*, it is well known, implies subjecting soil to various ploughings, harrowings, grubbings, &c., and at the same time allowing it to remain for a certain period, either without sowing any crop upon it, as in *perfect* fallows; or arranging the seed sown in such a manner that they will suffer the land to be continually cleaned during the whole period of their growth, as in *fallow crops*. These two of course are mere modifications of each other.

The pure fallows will be best considered under two heads, Winter and Summer, because, although a complete fallow occupies both these seasons, still the changes effected in the soil are extremely different during the early and latter parts of the process.

Winter-Fallow.—All land which is to be either thoroughly fallowed, or prepared for a fallow-crop, is well ploughed in autumn, after the harvest is completed, and this should be as deep as possible, eight or nine inches at least, or even the trench plough may be used if it appear necessary. Great care should be taken in this operation that the land be laid in such a manner as to keep it as dry as possible, more especially to prevent the surface-water from stagnating on any one spot; for which purpose the method of *cleaving with open furrows*, as it is called, is the most effectual, as by this means the ridges are divided in two, and hence the number of water-courses doubled; in other cases again, *gathering up* may be had recourse to for the same purpose. After this ploughing, the land is allowed to rest until the following spring, and during this interval various changes take place, which it will be necessary for us to consider carefully; these are the destruction of weeds, and probably insects, and the more complete pulverization of the soil. One of the chief advantages to be gained by fallowing is undoubtedly the destruction of weeds, and consequently, if the land be ploughed in the autumn to a considerable depth, and the under surface exposed to all the severity of the winter, the tender fibres of the roots of these weeds are thereby destroyed, and the plants themselves of course die; so that, for perennial weeds, the winter-fallow is an effectual remedy; the annual ones, however, have, long ere this period, shed their seeds, and consequently a great many of these may escape injury. In addition, however, to the destruction of weeds, the winter-fallow is supposed to clear the land of many insects, which during these months retire below the surface of the soil, to protect themselves from the severity of the season. This, however, is not found to be strictly correct, and I doubt if the winter-fallow is ever very effectual in promoting the destruction of insects, and for this reason, very few of these animals penetrate to any considerable depth into the soil, the average being from three to four inches; if, then, the ploughing is carried to the depth of eight or nine inches, it follows that by this means the insects are even better protected from the inclemency of the weather than if the land had been left untouched; * and the spring cross-ploughing, harrowing, &c., will be sure to turn them up, so that they will then be all ready to return their thanks to the farmer for his kindness, by doing him all the damage in their power. The same holds true with the germs of annual weeds; these being self-sown, of course lie near the surface, and the ploughing will effectually prevent them from being injured by the cold, even should the season be sufficiently severe to destroy them were they left in their original position. The winter-fallow is especially useful in breaking up obdurate clods of earth; this change is brought about by various means, as the constant exposure to all the inclemencies of the weather, &c., but more particularly by frost. When a frost occurs, the water which is contained in the interstices of the clods of earth is of course converted into ice, during which change it has been distinctly proved that it expands with great force; so that, by this expansion, the particles of earth are of course separated from each other, and thus the whole mass rendered much more friable. This probably is the most essential benefit derived from the winter fallow, for it not only does away with the necessity of the repeated ploughings and harrowings which the soil would otherwise require to bring it into a fit state for receiving the seed, but it at the same time greatly facilitates the subsequent removal of root-weeds, &c.; and in this manner therefore makes the land beautifully clean for the spring sowing.

Summer Fallow.—This is the true fallow, and is had recourse to for the express purpose of cleaning the land thoroughly, both of annual and perennial weeds, and at the same time to refresh it by rest, and renew it by a plentiful addition of manure; so that after summer-fallow land is considered to be in the highest state of perfection,—in fact, when used, it always forms the commencement of the rotation. A great many speculations have been hazarded upon this point, both by practical and scientific men; some of the former in objecting to the process as an unnecessary waste of time, and many of the latter in endeavouring to explain its mode of action. With regard to the first of these I shall say but little, as that would require too much detail: it may be remarked, however, that the best farmers of the true wheat soils (clay loams) agree, that, on the whole, the summer-fallow is the safest preparation for this crop; and, moreover, that, if the clay be very obdurate, it is indispensable, in order that the land may be kept clean and open. For the lighter soils, however, the adoption of fallow-crops has almost entirely superseded the necessity of true fallow, and is certainly the most economical.

---

* Of course this refers only to the greater number of the insects, for some of them will undoubtedly be exposed between the furrow-slices, and thus most probably be destroyed.

With regard to its action, however, we must descend more into particulars. 1*st*, Some say that it is useful solely by the destruction of weeds; some that it actually refreshes exhausted soils; and others hold that its beneficial effects are owing to the decomposition of excrementitious matters contained in the soil. That it is useful by destroying weeds is perfectly clear, for, by the repeated tillings to which the land is subjected, these plants are broken down in all the stages of their growth; and that farmer must be unwarrantably careless who allows a single weed to ripen on a field which is in summer-fallow. It may likewise be useful in destroying insects, for if no vegetable is allowed to grow, they must either die of starvation, or migrate to some other spot, where they will be better provided for.

2*dly*, Summer-fallow is supposed actually to refresh the soil, after it has been exhausted by previous cropping; this remark, of course, must refer to the soil as it existed previous to the fallow, and not after the addition of large quantities of manure, which always forms a part of the process; for it certainly does not require any great depth of knowledge to discover that land will become richer after the addition of a considerable quantity of manure! How then can this exposure render the soil more fertile? We have already seen that the fertility of soil by no means depends merely upon the proportion of organic matter which it contains, but much more upon the state in which such matter exists, since, as long as it is *insoluble*, it is perfectly *useless*. Hence the question comes to be, Can summer-fallowing reduce hitherto *insoluble* organic matter to such a state that it is capable of being absorbed by plants? We have already had occasion to remark, that this change is most probably effected by some process analogous to fermentation and putrefaction; to effect which purposes it is requisite that the substances be exposed to the joint influence of *moisture*, *air*, *light*, and *heat*. Now we shall find that the summer-fallow combines all these requisites; by the land being thoroughly and repeatedly ploughed, the whole, or nearly so, of the organic matter contained in it must be exposed for some time to the action of these various agents, and thus putrefaction aided to a great degree, and a stock of soluble matter prepared for the next crop; in fact, the process may be very aptly compared to *cooking* previous to the seed being sown, in order that they may not have to wait for their food until they are half famished.

3dly, Some suppose that summer-fallow acts by the destruction of excrementitious matter. Here we have Professor Rennie's theory again. He states, that, by the frequent turnings of the earth, and exposing it to the heat of the summer sun, the dark excrementitious matters of the soil are decomposed, and the land thus rendered more wholesome for the succeeding crop; and moreover, that the reason why this process is more necessary for clays than sands is, that, in the latter class of soils, the excrement may evaporate, or may be carried down with descending moisture, provided the subsoil be open and porous; and lastly, he compares this excrement to barren peat. Unfortunately, however, for this theory, each of these statements can be easily explained, without any reference to the excretory powers of plants, which at best is not sufficiently well established at present. First, with regard to the decomposition of the excrement by exposure, and consequently the rendering of the soil more wholesome for the succeeding crop; from all that I have been able to gather from any work upon the excretions of plants, it appears that the advocates of this theory merely consider that this discharged matter is injurious to plants of the same kind, and not that it is hurtful to vegetation in general: on the contrary, M. Macaire himself states, that the excrement of the *bean* and *pea* is useful, instead of injurious, to *wheat* plants; so that the idea of rendering the land more wholesome cannot hold good, except summer-fallow were employed for the purpose of restoring fertility to soil which had been exhausted by the constant repetitions of the same crop. Secondly, as to the clays requiring summer-fallow more than sands; this, I take it, depends upon their texture not permitting the free action of air, &c. upon the insoluble vegetable fibre which it contains, in order to effect its decomposition; hence the liability of such soils, when left in permanent pasture, to lose heart from an accumulation of vegetable matter. Lastly, the similitude of the excrementitious matter to barren peat is improbable, from the following facts. Peat consists of undecomposed vegetable fibre, and most frequently likewise some antiseptic substance (probably modified *creosote**), which prevents the decomposition of any organic matter, either naturally existing in it, or artificially added to it; and hence the cause of the sterility of such soils, all the organic matter being in an *insoluble* state. The excrements described by M. Macaire, on the other hand, are stated to be *soluble*; for example, that of *beans* is said to resemble *gum*. For these reasons, would it not be better to leave the excretory theory alone? At all events, until more extensive experiments have been performed, in order to prove more unequivocally than has hitherto been done, that *all* plants do really excrete a matter injurious to themselves, when placed under perfectly *natural* circumstances.

We have thus examined pretty fully into all the different methods employed by farmers, both to render the soil fit for cultivation, in the first place, and afterwards to preserve it constantly in that condition; and we have seen that all these processes are founded upon strictly scientific principles; and, moreover, that they require an accurate knowledge of these principles, in order that they may be advantageously put to practice; and, lastly, that, with some of them, it is necessary, before any one attempts to apply them practically, that he should have an extensive acquaintance with many of the higher branches of science.

---

* Dr Cormack's Prize Essay on Creosote.

With these remarks, we shall conclude the first division of the present sketch of Scientific Agriculture, as we have now finished the account of the nature and chemical composition of soil, its requisites for supporting vegetable life, and the various methods resorted to by farmers to bring it into a fit state for cultivation. Our next paper will therefore commence the all-important and extensive subject of *Manure.*

ACCOUNT OF THE HIGHLAND AND AGRICULTURAL SOCIETY'S SHOW AT GLASGOW IN 1838.

Judging by the increased number of stock entered for competition, and the very great concourse of people assembled at one time within the show-yard, this was the most important meeting that has yet taken place under the auspices of the Highland and Agricultural Society of Scotland. The following abstract of the numbers of the stock exhibited at the last four shows of the Society indicates a gradual increase, and it is a fair assumption to take this as a criterion of the increasing interest taken in the meetings of the Society by the agriculturists of the country.

	Ayr.	Perth.	Dumfries.	Glasgow.
Cattle,	309	265	181	461
Horses,	70	46	77	121
Sheep,	324	416	512	274
Swine,	46	18	14	47
Totals,	749	745	784	903

The 903 heads of animals exhibited at Glasgow may be characterized in this way—

Cattle,	Oxen,	54	
	Bulls and bull stirks,	116	
	Cows,	115	
	Heifers,	85	
	Competing cattle,	370	
	Extra, do.	91	
			461 in 367 lots.

		Brought over,			461 in 367 lots.
Horses,		Stallions and extra colts,	41		
		Mares and fillies,	48		
		Competing horses,	89		
		Extra, do. and sweepstakes,	32		121 in 113 lots.
Sheep,	Tups,	Blackfaced tups,	16		
		Cheviot, do.	4		
		Leicester, do.	51		
				71	
	Ewes,	Blackfaced ewes,	55		
		Cheviot, do.	10		
		Leicester, do.	51		
				116	
	Wethers,	Blackfaced wethers,	30		
		Cheviot, do.	0		
		Leicester, do.	9		
				39	
		Crosses of various kinds,	22		
		Competing sheep,	248		
		Extra, do.	26		274 in 115 lots.
Swine,		Boars,	11		
		Sows,	20		
		Pigs,	9		
		Competing swine,	40		
		Extra, do.	7		47 in 39 lots.
		Total,			903 in 634 lots.

At the Show at Glasgow in 1828, the number of cattle was, ... 302

In 1838 the number was, ... 461, additional in 1838, 159.

In 1828, number of horses was, . . 42.

In 1838 it was, ... 121, additional in 1838, 79.

The greatest number exhibited at any former Show was at Dumfries in 1837, when the total number was 784; at Glasgow in 1838 the total number was 903, giving an increase of 119 head. Of the other kinds of competition at Glasgow in 1838, the numbers were as follows:

For Butter,	18
... Full milk cheese,	15
... Skim milk, do	6
... Wool,	8
... Roots and seeds,	13
... Implements,	28
	In 88 lots.

An idea of the number of people assembled within the show-yard, after the admittance of the public at twelve o'clock, may be nearly ascertained from these data. The sum total collected at the gates was L.846, of this about L.36 were collected at the gallery at half a crown a-head,

equal to about	300	persons.
The remainder L.810, at one shilling a-head, gives	16,200	—
One person is obliged to take charge of each lot exhibited,	722	—
The number of persons present must therefore have been	17,222	

besides workmen and official people. At four the gates were thrown open to the populace, who entered in numbers beyond calculation. Those of the nobility who honoured the exhibition with their presence were beyond all former precedents. There were present the Duke of Sutherland, President of the Society, Duke of Hamilton, Duke of Montrose, Marquis of Tweeddale, Earl of Rosebery, Earl of Dalhousie, Earl of Rothes, Earl of Leven, Lord Belhaven, President of the Local Committee, Lord Lynedoch, Lord Kelburne, Lord Waterpark, Lord Clements. The dinner, which usually terminates the labours of the show-day, was set out and partaken of by 1800 guests, in the pavilion erected in Hope Street, for Ducrow's Equestrian Arena, which was brilliantly illuminated with gas lustres, and beautifully decorated with designs emblematical of rural pursuits. From all these particulars may be deduced the very great interest which this meeting of the Society excited, and should those meetings continue to increase in the same ratio they have hitherto done, it will be difficult to conceive how the amount of business will be able to be gone through in one day.

The Show was held in the New Cattle Market, on Thursday 27th September, and was accessible on the south by Graham Square, and on the north by Duke Street. The stock were arranged in classes around the walls of the yard, and when viewed from the gallery erected for the Ladies, near the southern gate, had a very pleasing effect, although the causeway of stones was less agreeable for the stock to stand upon than a lea field would have been. The seeds, roots, cheeses, and wool were accommodated in the Sheds belonging to the market; and so great was the number of implements entered that a small field adjoining had to be fenced in on purpose for the exhibition of that particular class. The weather was brilliantly fine.

The following gentlemen were appointed Judges for deciding the Premiums for the different classes of Stock, and other subjects of competition:—

For Short-Horn Cattle.—The Marquis of Tweeddale; Mr James Chrisp, Doddington, Northumberland; and Mr John Heriot, Ladykirk, Berwickshire.

For Ayrshire Cattle.—Mr Alexander Bartlemore, Seabrae, Ardrossan, Ayrshire; Mr A. Wilson, Deanside, Renfrewshire; Mr Glen; Mr Finlay, Lyonstone, Maybole, Ayrshire; Mr Fulton, Baig, Ayrshire; and Mr Allan.

For West Highland Cattle.—Mr Maclean, Glenforsland; Mr Robert Carmichael, Raploch Farm, Stirlingshire; Mr Donald Macdonald, Craigruie, Callander, Perthshire; and Mr Stewart, of Achadashanaig, Mull, Argyllshire.

For Galloway, Polled Angus, and Polled Aberdeenshire Cattle.—John Miller, Esq. of Ballumbie; Mr W. D. Proctor, Glammis; and Mr Andrew Dalgairns, Ingliston, Forfarshire.

For Crosses and any Breed.—The same Judges as for the Short-Horn Cattle.

For Horses.—Sir John Hope, Bart.; Mr Fleming of Barrochan; Mr Thomas Joplin, Castlelaw, Berwickshire; and Mr William Dick, lecturer on Veterinary Surgery, Edinburgh.

For Black-Faced Sheep.—Mr Donald Macdonald; Mr Maclean; Mr Stewart; and Mr Carmichael.

For Cheviot Sheep.—Mr Thomas Scott, Letham, Roxburghshire; Mr William Grieve, Branxholm Park, Roxburghshire; and Mr James Oliver.

For Leicester Sheep and Cross Breeds.—The same Judges as for Short-Horn Cattle.

For Swine.—His Grace the Duke of Montrose; Mr Jopling; Robert Wallace, Esq. of Kelly; and R. C. Bontine, Esq. of Ardoch.

For Implements of Husbandry.—Sir John Robison, Edinburgh; James Smith, Esq. of Jordanhill; Mr Smith, Deanston; Mr Slight, Curator of the Society's Machines; Mr T. Jameson Torrie, Edinburgh; J. Burn Murdoch, Esq. of Coldoch, Stirlingshire; and Mr Henry Stephens, Edinburgh.

For Wool.—Mr Pringle, Haddington.

For Roots and Seeds.—Mr Brown of Dumbrechill; Mr Murray, Curator, Botanical Gardens, Glasgow; Mr Noble, London; Mr Turnbull, Perth; Mr Johnston Smith; and Mr Lawson, Edinburgh.

For Butter and Cheese.—Mr William Dodd; and Mr William Dick, Glasgow.

1. *Cattle.*—Of the class of *Short-Horn* Cattle 47 animals were exhibited. 11 bulls calved between 1st January 1833 and 1836; 5 bulls calved after 1st January 1836; 6 bulls calved after 1st January 1837; 13 cows of any age; 9 heifers calved after 1st January 1836; and 3 oxen not exceeding four years old. This class exhibited fine points of breeding, fully equal to what may have been expected to be exhibited in that part of the country where this valuable breed does not receive the attention bestowed upon it in other districts, but it will be observed that the premiums were carried off by breeders on the east coast. The premiums awarded by the judges were as follow: (We may mention that the bull which gained the first premium was immediately thereafter bought by a gentleman in Ireland.)

For the best bull calved between 1st January 1833 and 1st January 1836.—Twenty-five Sovereigns, to Mr Thomas Ferme, Braidwood, Edinburgh.

For the second best—Ten Sovereigns, to Mr Archibald Stoddart, Drumelzier-haugh, Peeblesshire.

To Mr James Burnet of Seton, the breeder of the best bull in this class—The Honorary Silver Medal.

> It was a condition attached to these premiums, that the exhibitors should be obliged to let out the prize bulls to serve at least forty cows during the season 1839, within such portion, and at such places of the four counties of Lanark, Renfrew, Dumbarton, and Argyll, as the local Committee should fix, on payment of ten shillings and sixpence for each cow,—the owner if resident within the district to have a preference of service for his own stock.

For the best bull, calved after 1st January 1836—Ten Sovereigns to Mr P. H. Hume, Lawfield, Haddington.

For the best bull stirk calved after 1st January 1837—Seven Sovereigns, to Robert Bruce, Esq. of Kennet.

For the best cow of any age—Ten Sovereigns to the Duke of Buccleuch.

For the best ox, calved after 1st January 1836—Seven Sovereigns, to Mr R. Walker, Ferrygate, Haddingtonshire.

For the best heifer, calved after 1st January 1836—Seven Sovereigns, to Mr James Mowbray of Cambus.

Second best—To Mr James Burnet, Aberlady, Haddingtonshire.

Of the class of *Ayrshire cattle*, the exhibition was very large, not fewer than 255 animals of that breed having been brought forward. Of that number 79 were bulls, 148 cows and queys of different ages, and only 2 oxen in competition for premiums; the practice of the breeders of Ayrshire cattle being to bring them up for the dairy, and not to the shambles, excepting as fatted calves. There were besides 26 shewn of this class in the extra stock. The shew of Ayrshires was in every respect superior to that at Ayr in 1835. The premiums for this class of stock were awarded as follows:—

For the best bull, calved between 1st January 1833 and 1st January 1836—Twenty Sovereigns, to Mr Thomas Bowman, Hall-hill, Lanarkshire.

For the second best—Ten Sovereigns, to Mr James Wilson, Renfrew.

To the *Breeder* of the best bull in this class—the Honorary Silver Medal.

> A similar condition was attached to the premium in this class as is intimated in reference to the premiums for bulls of other breeds.

For the best two-year-old bull, calved after 1st January 1836—Ten Sovereigns, to Mr Robert Logan, Mains of Kilbirnie, Ayrshire.

For the second best—to Mr William Jamieson, Newhouse, Ayrshire.

For the best bull stirk, calved after 1st January 1837—Ten Sovereigns, to Mr John Anderson, Smithston, Dumbartonshire.

For the second best—to Mr James Smith, Broomberry, Ayrshire.

For the best milch cow, calved prior to 1st January 1835—Fifteen Sovereigns, to Mr Laurence Drew, Carmyle, Lanarkshire.

For the second best—Seven Sovereigns, to Mr John Brock, Barns of Clyde, Dumbartonshire.

For the best cow, calved after 1st January 1835—Seven Sovereigns, to Messrs Robert and Thomas Jackson, Stanley Muir, Dumbartonshire.

For the second best—to Mr Laurence Drew, Carmyle.

For the best two cows in milk, calved after 1st January 1836—Seven Sovereigns, to Mr Thomas Bowman, Hall-hill, Lanarkshire.

For the second best—to Mr John Cairns, Netherhouse, Lanarkshire.

For the best three cows, of any age, in milk, and having had calves the season preceding the Show—Ten Sovereigns, to Mr Laurence Drew, Carmyle.

For the second best—to Messrs John M'Kerrow and Brothers, Auchinstary, Dumbartonshire.

For the best two queys, calved after 1st January 1836—Seven Sovereigns, to Mr John Muir, Glenfallow.

For the second best—to Mr Hugh Kirkwood, Langmuir, Ayrshire.

For the best two oxen, calved after 1st January 1835, shewing the most symmetry, fat, and weight—Ten Sovereigns, to James Smith, Esq. Deanston.

Of the class of *West Highland cattle*, the exhibition was scarcely so extensive as might have been expected in this part of the country, only 120 animals having been shown. These consisted of 15 bulls, 10 cows, 24 queys, and 59 oxen in competition for premiums, and 17 in the class of extra stock. The quality of the animals was generally good, and some very fine. The premiums awarded to this class were as follows:—

For the best bull, calved between 1st January 1831 and 1st January 1837—Twenty Sovereigns, to Mr Charles Stewart, Chesthill, Perthshire.

For the second best—Ten Sovereigns, to Lachlan Macneill, Esq. of Drumdrissaig.

To Mr James Menzies, Glengoldee, the *Breeder* of the best bull in this class—the Honorary Silver Medal.

The conditions attached to this premium are the same as those of the other breeds.

For the best bull stirk, calved after 1st January 1837—Seven Sovereigns, to Mr William Cunningham, Craigends, Renfrewshire.

For the best cow, of any age—Ten Sovereigns, to the Marquis of Breadalbane.

For the second best—to the Marquis of Breadalbane.

For the third best—to Mr Charles Stewart, Chesthill.

For the best two oxen, calved after 1st January 1834—Ten Sovereigns, to Lorn Campbell, Esq. Roseneath.

For the best two oxen, calved after 1st January 1835—Seven Sovereigns, to Colin Campbell, Esq. of Jura.

For the best two oxen, calved after 1st January 1836—Seven Sovereigns, to Messrs Alex. and Archd. Stewart, Inverscaddle, Argyllshire.

For the best two heifers, calved after 1st January 1835—Ten Sovereigns, to Mr John Macdonald Inverlocharig, Perthshire.

For the best two heifers, calved after 1st January 1836—to the Marquis of Breadalbane.

For the best five oxen, calved after 1st January 1837, bred by the exhibitor—Ten Sovereigns, to the Marquis of Breadalbane.

The classes comprehending the *Polled Angus, and Galloway, Aberdeenshire*, and *Cross* breeds having been competed for in so small numbers, that it is not worth while to particularize them more than to give the awards of the premiums.

For the best Ox of the Galloway Breed, calved after 1st January 1834—Ten Sovereigns, to William Forbes, Esq. of Callander.

For the best Angus Ox of the same age—Ten Sovereigns, to Mr David Skirving, Camptownhead, Haddington.

For the best Aberdeenshire Ox of the same age—Ten Sovereigns, to Mr William Milne, Lochill, Haddington.

For the best Ox, first cross of Short Horn, with Ayrshire, Galloway, Fife, West Highland, Aberdeen, or Angus Stock, the particulars of the cross being specified, calved after 1st January 1834, shewing most symmetry, fat, and weight—Ten Sovereigns, to William Wauchope, Esq. of Edmonstone.

In this class the Judges noticed an ox shewn by Mr Walker, Ferrygate, as worthy of commendation.

For the best ox not exceeding 36 months old—Ten Sovereigns, to Mr Robert Walker, Ferrygate.

For the best ox, of Any Breed, calved after 1st January 1834, the particulars of the breed and age being specified—Ten Sovereigns, to Archibald Stirling, Esq. of Keir.

2. *Horses.*—The exhibition of *horses* was much the largest of any that has taken place at the Society's Shows, the number being altogether 121. This result might have been in some measure anticipated, as Lanarkshire is the county which has long bred and possessed the best race of draught horses in Scotland, almost all the stallions which serve in the other districts of the country being reared in it. For competition 31 stallions, 10 entire colts, 20 mares, and 28 fillies appeared, besides 32 others which were entered in the class of extra stock, and for sweepstakes. The stallion to which only the second premium was awarded last year at Dumfries, on account of his great *size*, obtained the first premium. A very small Shetland pony stallion was exhibited among the extra stock; and it was amusing to observe the contrast in size betwixt it and the premium horse. These were the awards of the Judges.

For the best stallion for the improvement of the breed of draught horses, not under three, and not exceeding eight years and five months old—Thirty Sovereigns, to Mr James Steedman, Boghall, Edinburgh.

> Evidence is required that the prize horse had produce, and it is a condition attached to the premium, that the exhibitor shall be obliged to let out the prize horse for season 1839, to serve within such portion and within such place of the county of Lanark, Renfrew, and Dumbarton, as the local committee may fix. The number of mares served not to exceed seventy, and the charge One sovereign for each.

For the second best stallion—Fifteen Sovereigns, to Mr Samuel Clarke, Mauswrey.

For the best breeding mare for agricultural purposes, not exceeding twelve years old, and having had at least one foal—Ten Sovereigns, to Mr John Finlay, Springhill, Lanarkshire.

For the second best—Seven Sovereigns, to Mr James Fram, Broomfield, Lanarkshire.

For the best entire colt, for agricultural purposes, rising three years old—Ten Sovereigns, to Mr Lawrence Drew, Carmyle.

For the second best, to Mr Alexander Kerr, Gallowberry.

For the best filly, for agricultural purposes, not exceeding thirty-four months old, to Mr Thomas Scott, Easter Calder, Lanarkshire.

> A Sweepstakes was offered for Clydesdale mares of any age, having been *bona fide* the property of the exhibitor from 1st May 1838. The winner of the first prize at the Glasgow, or any of the Society's previous General Shows, could win the sweepstakes. Mares entered for the sweepstakes might compete in the premium class if they came in all respects within the terms of the conditions, or they might enter as extra stock. Entry money—One Sovereign ; the gainer was Mr Jackson, Stanley Muir; and the Judges noticed favourably a mare belonging to Mr King, Blochairn.

3. *Sheep.*—Of the various breeds of *sheep* exhibited, the number was small compared to other places where the Society's Meetings have been held; but the counties around Glasgow, especially those immediately interested in the Show, have never been eminent for sheep stock, partly owing to the want of extensive upland and hill pasture, for the blackfaced and cheviot breeds, and partly the lower ranges of grass land being occupied by cattle and dairy stock, to the exclusion of Leicester sheep. As might have been expected in these circumstances, most of the successful competitors of sheep stock reside in the eastern and southern portion of the country. Without farther detail, we shall give the awards of the premiums at once.

1. *Blackfaced Breed.*—For the best two tups, not exceeding forty-five months old—Ten Sovereigns, to Mr Thomas Robertson, of Cairnmuir, Peeblesshire.

For the second best, to Mr James Welsh, Braefoot, Dumfriesshire.

For the best pen of five ewes, not exceeding five years and seven months old, selected from a regular breeding stock of not fewer than a hundred, and the pen having reared lambs for the season to the 1st of July, to Mr James Milligan, Kirkhope, Dumfriesshire.

For the best pen of five gimmers, to Mr Thomas Robertson of Cairnmuir.

For the best pen of five dinmonts, to Mr James Hunter, Newlistonhaugh, Linlithgowshire.

For the best pen of five wether sheep, not under one year and eight months, and not exceeding three years old, to Mr John Phillips, Glasgow.

For the best pen of five wethers, not exceeding three years old, fed exclusively on hill pasture since twelve months old to Mr Malcolm, Cowbrough, High Craigton, Dumbartonshire.

For the best pen of five wethers, of any age, shewing most symmetry, fat, and weight, to Mr John Phillips, Glasgow.

2. *Cheviot Breed.*—For the best two tups, not exceeding forty-five months old, to Mr William Aitchison, Menzion, Peeblesshire.

For the best pen of five gimmers, to Mr Peter Hogg, Howcloth, Lanarkshire.

3. *Leicester Breed.*—For the best tup, not exceeding forty-five months old—Ten Sovereigns, to Mr James Moubray of Cambus.

For the second best, to Mr John Brodie, Amisfield Mains, Haddingtonshire.

For the best pen of three ewes of any age, to Mr John Brodie, Amisfield Mains.

For the best pen of three wethers, not exceeding thirty-two months old, to Mr John Dudgeon, Almond Hill, Linlithgowshire.

For the best pen of three tup lambs, to Mr William Mylne, Lochill, Haddington.

For the best pen of three ewe lambs, to Mr William Mylne, Lochill, Haddington.

4. *Cross Breeds.*—For the best pen of three wethers, a cross between Leicester tups and Cheviot ewes, to Mr Moubray of Cambus.

For the best pen of three wethers any cross, not exceeding four years and seven months old, the cross specified in the certificate, to Mr Moubray of Cambus.

For the best pen of five lambs, of any cross, which shall be of greatest value to the butcher on the day of competition—Five Sovereigns, to Lorn Campbell, Esq., Roseneath.

4. *Swine.*—Of the class of *Swine* the competition was pretty numerous, 40 animals having entered, besides 7 in the class of extra stock. The exhibition was uniformly good. The awards of the premiums were as follows:—

For the best boar, to Mr James Barr of Bowfield, Renfrewshire.

For the second best, to Mr Thomas M'Corrie, Whitefauld, Ayrshire.

For the best sow, to Mr Walter Burnside, New City Road, Glasgow.

For the second best, to Mr James Scott, Balgray, Lanarkshire.

For the best three pigs, not exceeding forty weeks old, to Mr Hugh Muir, Bluevale, Lanarkshire.

For the second best, to Mr James Newbigging, Poneil, Lanarkshire.

In awarding these premiums, attention was paid to the breeds most suitable for family use.

5. *Extra Stock.*—The Extra Stock of Ayrshire Cattle exhibited were thus commended by the Judges:—They considered the aged bull belonging to Mr Robert Kirkwood of High Longmuir, Ayrshire, as decidedly the best bull in the exhibition of this cattle. The pair of Ayrshire oxen exhibited by Mr Smollett of Bonhill, were considered very fine. The bull belonging to Mr Glassford of Bargarvon, was commended to notice. Of the extra Ayrshire cows, that belonging to Mr John Anderson was considered the best. The three quey stirks, of Mr Robertson, were commended. The Stirks belonging to Sir John Maxwell, and Mr Newbigging, were commended, as was the bull calf of Mr Anderson, Swithston. Of the extra West Highland cattle, the black-eared cow, belonging to Mr John M'Donald, was considered very superior. The dun cow, belonging to the Marquis of Breadalbane, was considered very handsome, and well-bred. The four-year-old heifer of Mr Campbell of Jura, was a very superior animal. Two four-year-old oxen, belonging to the Lord Justice Clerk, from Ayrshire, were considered very superior, as were two three-year-old oxen, belonging to Mr C. Stewart, Chesthill, Perthshire. The two three-year-old oxen, belonging to Miss Campbell of Blythswood, were commended. A North Devon ox, five years old, bred and fed by Lord Lyndoch, was an animal of good symmetry, excellent fatness and quality. Two Galloway oxen, shown by Mr Forbes of Calendar, were good handlers, and of excellent quality. Of extra sheep of all kinds, a fine tup of the Leicester breed, the two Southdown dinmonts, and the shearling tup shown by the Earl of Rothes, were well bred, and deserving of commendation. The two shear tups, and the eleven one shear tups, shown by Mr Brodie, of various bloods, were well worthy the notice of breeders. The two Highland tups, belonging to Mr Stoddart, Island of Arran, were good specimens of the breed of that island. The four Leicester ewes, and the Southdown tup, shown by Mr Crawford, Doonside, Ayrshire, were well-bred sheep. Of extra horses, there was nothing very remarkable, excepting two young colts belonging to Mr De Lisle, out of a thorough bred XYZ mare, by a Cleveland stallion, and a spotted horse of good symmetry and breeding. The extra sows, belonging to the Rev. Francis Gervais, of Cecil, in the county of Tyrone, Ireland, and Mr William Macdowall Barr, Renfrewshire, were commended.

6. *Wool.*—For the best lot of combing wool from Leicester sheep, the premium was awarded to Mr William Crawford, Doonside, Ayrshire; and for Blackfaced wool, the premium was awarded to Mr Neil Black, near Inverary, Argyllshire. There was a cross wool betwixt the Leicester ewe and Southdown tup, which was of excellent quality.

7. *Products of Live Stock.*—1. *Curing Butter.*—To the owner of any Dairy in the counties of Lanark, Renfrew, Dumbarton, or Argyll, who

shall have made and cured, and exhibited at the Show the best quality of butter for the market, and the quantity not being less than 2 cwt., during the year 1838, to Mr Wm. Peter, Temple.

For the second best quality, to Mr James Alison, Westfield.

2.—*Making Cheese.*—To the person in the counties of Lanark, Renfrew, Dumbarton, or Argyll, who shall produce the best specimen of sweet or full milk cheese, made of any variety that he finds most profitable for the market, the quantity not being less than one cwt. of 112 lb., 16 oz. to the lb., to Mr Peter Wilson, Middlefield, Poniel.

For the second best quality, to Mr James Fram, Broomfield.

To the owner of any dairy in the counties of Lanark, Renfrew, Dumbarton, or Argyll, who shall have made for sale the best quality of cheese, from skimmed milk, not being less than one cwt. during the season 1838, to Mr William White, Westown.

For the second best quality, to Mr Alex. Lyall, Knockreoch.

8. *Roots and Seeds.*—Among the invariably splendid collection which the Messrs Lawson & Son always exhibit at the meetings of the Society, not the least interesting was a vigorous specimenof the *Polygonum tinctorium*, dyer's buckbean, grown by them, and which, we understand, is undergoing at present a chemical analysis to ascertain the indigo it may yield. Could this plant, which is a native of China, be generally grown with the vigour that the Messrs Lawson & Son have experienced even in this inauspicious season, and should it be found to yield a sensible quantity of marketable indigo, it may hereafter prove a valuable acquisition to the agriculturist. Messrs Drysdale & Lawson of Glasgow exhibited an extensive collection of the grasses and cereal grains. The Messrs Drummond & Sons, Stirling, exhibited a selection of new and choice wheats, and other grains, a remarkably fine specimen of the Alsike Clover, a gigantic plant, measuring 13 feet, of the Selisia cow parsnip, and a specimen of home-prepared oil-cake. The collection of the Messrs Cleghorn contained a new hybrid turnip, and a fine specimen of a new gigantic oat. Mr Gray of Islay exhibited an extensive collection of seedling potatoes, amounting to 150 varieties, obtained from seed sown in 1835-6 and 7. Mr Bankier's collection of seedling potatoes, to the amount of one hundred and eighteen varietes, was also deserving of notice. Mr Stewart Murray of the Botanic Garden, Glasgow, exhibited a specimen of Tropæolum tuberosum, the tubers of which are used by the natives of Chili, as potatoes; also another plant used for a similar purpose by the people of Santi di Bagota; as also nine sorts of potatoes from Lima, one of which, a description of kidney, has a peculiar form. Mr John Lewin, Wickham market, Suffolk, sent for exhibition, a new wheat, termed the Eclipse. Mr John Rivers exhibited a new clustered white wheat; and Mr North Dalrymple, of Cleland, a sample of a new early oat, raised from a single stalk. Mr Samuel Girdwood of Carey Lament, exhibited a variety of barley, called the Bute barley, propagated from an ear found by him about three years ago.

9. *Implements of Husbandry.*—The number and value of the articles brought forward for exhibition, greatly exceeded anything which had been seen on former occasions, and afforded a striking proof of the increasing attention which the encouragement given by the Society is drawing to this department of the art of agriculture. Amongst the articles produced were several double mould-board ploughs, which had been brought in competition for the premium offered by the Society. Measures were taken for a comparative trial of their merits before competent judges on the day after the exhibition. Although it is inexpedient, in a report of this nature, to notice every implement that was brought forward, yet the following exhibitors appear to deserve premiums by the award of silver medals, as follows, namely:—To Mr Hugh Smith, Waterfoot, Mearns, Renfrewshire, for a jointed drill harrow, and gleaning rake. To Mr William Mather, Kalemouth, near Kelso, for the general good style of the implements sent by him for exhibition. To Messrs A. W. Smith and Co., millwrights, Paisley, for the excellence of the workmanship of their implements. To Mr Robert Law, Shettlestone, near Glasgow, for the highly-finished workmanship of the numerous implements exhibited by him. To Messrs Riddell and Connell, Provan Mill, and Mr J. Geddes, near Dumfries, for several well-made machines. The Messrs Drummond and Son, Stirling, exhibited a very extensive and interesting series of well-constructed implements. There were also exhibited three well-finished carriages, built upon the patent of Mr Adams of London, by Messrs John Buchanan and Co. of Glasgow.

The competition of the turn-wrest ploughs, and the exhibition of the mole, subsoil, trenching, and draining ploughs, which took place on the 28th September on the farm of Cairnton, a few miles to the eastward of Glasgow, excited such an interest, that perhaps not fewer than a thousand persons, from the peer to the peasant, came to witness them. The premium of ten sovereigns was awarded to Mr Wilkie, agricultural implement maker, Uddingstone, near Glasgow, for the best plough. This implement, simple as it is, displays ingenuity in shifting and fixing the coulter to the land side of the plough, while the change of the mould-boards is effected. It may be found particularly described, with a figure, in this number of the Society's Transactions, at page 484. Its use is to plough land of high acclivities at right angles to the line of ascent, and to act at times as a subsoil plough. Doubts may reasonably exist of the real utility of such an implement, for, in such situations, and moving in the direction desired, it must always throw the plough-furrow down the hill; and, in pursuing this operation for an indefinite number of years on the same piece of ground, the effect must be to bare the upper part of the field of soil. The usual mode of ploughing high acclivities of land in a diagonal direction, answers the purpose, in our opinion, of turning over the soil in an efficient manner, whilst it avoids the objection of always throwing down the furrow. Besides, it is very unsafe to plough sloping ground across its face with a permanent furrow until it has been thoroughly drained, on account of the obstructions which the furrows may present against the descent of the water, which is frequently seen bursting out in acclivities. Should the proposed use of this turn-wrest plough have the effect, as a plough, of causing land in that state to be thorough drained, it will effect great good; but, on the other hand, should its employment as a subsoil plough be substituted for that essential forerunner to all improvement, thorough draining, it will as certainly effectuate great evil. Besides all this, the sloping direction of the ridges is conducive, in steep slopes, to guiding the formation of furrow-drains.

The mole-plough is quite a new implement in this country. It performed its work slowly, but surely. It is obviously only fitted for action in pure clay subsoils; and, when those exist under old pastures, as in gentlemen's parks, it may partially drain the ground with comparative economy; and, being economical, its use may be frequently repeated in the same field. In the experiment, we conceived that the mole-run was formed too deep, and this observation was confirmed by an English gentleman who had seen it extensively used in England, and who spoke very warmly in its favour. A short account of this implement by Mr Aiton, will be found in a preceding article in this number.

Of the draining ploughs, that of Mr MacEwan's is decidedly the most effective, though its very cumbrous appearance impresses one with a very different idea of its working powers. Our minds are not quite satisfied of the economy to be derived from the use of this implement when compared with the cost of the spade in cutting narrow drains, especially for tiles. At all events, it is distressing to see twelve horses yoked together; and, as very few farms can afford that number, this implement does not seem intended for general use.

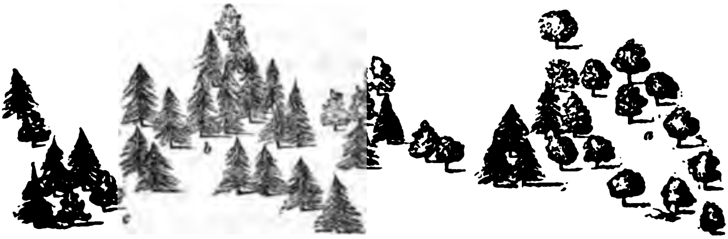
THE AGRICULTURIST'S NOTE-BOOK.—NO V.

The Suburban Gardener and Villa Companion. Illustrated by numerous Engravings. By J. C. Loudon, F.L.S., H.S., &c. London, octavo, 1838.—In our No. for March last, we inserted a short notice of this excellent work, while it was in course of publication. From our knowledge of the Author's capabilities, zeal, and resources, we,from its commencement, entertained high expectations of its merits and usefulness to that class for whose instruction it was principally intended. The work is now completed in 15 Nos., and our expectations have been fully realized. In the title it is stated to be "intended for the instruction of those who know little of gardening;" it is indeed written in that plain, perspicuous and interesting style, which must be understood by the veriest tyro in horticulture, illustrated as it is by no less than 343 beautiful woodcuts. We think we ought to know something of gardening, having studied it long, practised it successfully, read much connected with it, as also having ventured to write some occasional articles on it; yet, with all these advantages, we feel by no means ashamed to say, that a perusal of the *Suburban Gardener* has added not a little to our stock of horticultural knowledge; and when asked, as we have occasionally been, what work we would recommend to a gentleman of moderate fortune, who wished either to purchase or erect a villa residence, and to be architect and gardener himself as far as direction might go, we would say without hesitation, that with these objects in view, the small sum laid out in purchasing, and the time spent in perusing the pages of the *Suburban Gardener*, will be amply repaid, both in point of profit and pleasure; and amongst the many publications on rural affairs, now in the market, we know of none that we could with nearly equal confidence put into the hands of such a friend.

What we esteem as a prominent feature in this work, is the masterly and original manner in which every thing connected with *taste* is delineated. The enthusiastic author expatiates freely and conclusively when luxuriating in his favourite science of landscape gardening. We shall lay before our readers a few extracts on this subject, which to some may be useful, and at the same time afford a specimen of the manner in which the author treats such subjects.

"In the disposition of a great number of sorts of trees and shrubs in a plantation, some principle of order must be adopted to produce either variety or harmony. If the sorts are mixed together indiscriminately, the result is left to chance; if they are mixed together as equally as possible, then the result must necessarily be monotony, by the same number of kinds appearing in every part of the plantation; and if each kind is kept in a group or mass by itself, there will be a risk of want of connection, and consequently of unity in the general result. In what way are all these difficulties to be overcome? Chiefly we should say, by keeping each sort by itself, and placing all those sorts nearest each other which are most alike, avoiding all formality in the outlines of the spaces allotted to each sort, and allowing these spaces to indent or ramify into one another." (p. 152.)

When plantations have been originally formed of a regular mixture, which in nine cases out of ten, has been the case with plantations of twenty years old and upwards, if the forester shall make himself familiarly acquainted with those principles, and act upon them in *thinning*, he may succeed in leaving groups of different species and varieties of trees harmoniously blending with natural irregularity into one another; and if he has the slightest spark of taste in his mind, he will be enchanted with the result; in fact he may in a few winter days, by judicious and tasteful thinning, create a new feature with sudden, full, and lasting effect on the landscape, which will continue long to afford delight to many who may be pleased with the effect, but without being able to tell why. We cannot communicate to our readers by words, the full effect of blending different groups nearly so distinctly as by a woodcut, with these accompanying remarks of the author.



" When the groups are very dissimilar, such as when the pine and fir tribe adjoin deciduous trees, the union must be very gradual, by means of numerous indentations and ramifications of the one group into the other. For example, suppose it were desirable to join a large mass of different species of oak (*a*) with a large mass of different species of pine (*b*); then, adjoining some of the evergreen oaks in the one group (*a*), place one or two pines, which grow in large and compact forms; and against some of the half-evergreen oaks, such as the Fulham or old Lucombe oak, place one or two pines of comparatively slender growth. In like manner, in the opposite group, evergreen and half-evergreen oaks may be planted among the pines, as at *c*, so as to form the extreme points of the oak group in that direction; and, as the one group approaches the other, not only evergreens and half-evergreens, but deciduous species, in equal numbers, may be introduced. In all this, care must be taken to avoid a regular progression, and every thing like formality. By such means, a degree of union is at first indicated, and afterwards gradually increased, till, at a point equidistant between both groups, the number of plants belonging to each group will be equal. In this way, trees of the most opposite kinds may be introduced in the same plantation, even adjoining each other; but, where the plantation is of any extent, and many kinds are to be introduced, the introduction of opposite kinds adjoining each other can never be required. It can never, for example, in such a plantation, be requisite to unite the weeping willow with the Scotch pine; nor the poplars with the larch or the weeping birch; nor very large-growing trees, such as the elms, with trees of small size, such as the pyrus or the cratægus; nor trees with pinnated leaves, such as the ash and the acacia, with such as have narrow grass-like or needle-like leaves, such as the deciduous cypress, and pines and firs," (p. 153.)

The following short extract relates to the formation of walks, and may be useful in giving hints to those who are their own landscape gardener in the small extent of ground usually attached to suburban villas.

" In proceeding to lay out a small place, with the view of making the most of it, the first thing is to ascertain what extent of walk may be produced, without ever shewing any portion of the walk to the pedestrian, except that which is immediately before him; this is evidently more difficult to accomplish in a small place with a level surface, than in one where it is sloping or undulating; but by creating artificial undulations, even on a very small scale, much may be accomplished in a very little space, and the effect of such undulations may always be determined beforehand," (p. 155.)

We pass much interesting matter, interesting in a high degree to the occupants of fourth, third, and second rate gardens, to notice some remarks by the author on *first rate gar* *dens*, and in this division Wimbledon House, Surrey, the property of Mrs Marryat, is prominently noticed. "Among the more beautiful and remarkable green-house plants that have flowered for the first time at Wimbledon is the *Tacsonia Pinnatistipula*, one of the most elegant, and at the same time singular of climbing shrubs." (p. 629.) This singular and elegantly beautiful plant flowered at Fingask Castle, Perthshire, last season; and from the beauty of its flowers, and elegant appearance of its fruit, it is likely soon to become a general inhabitant of the conservatory.

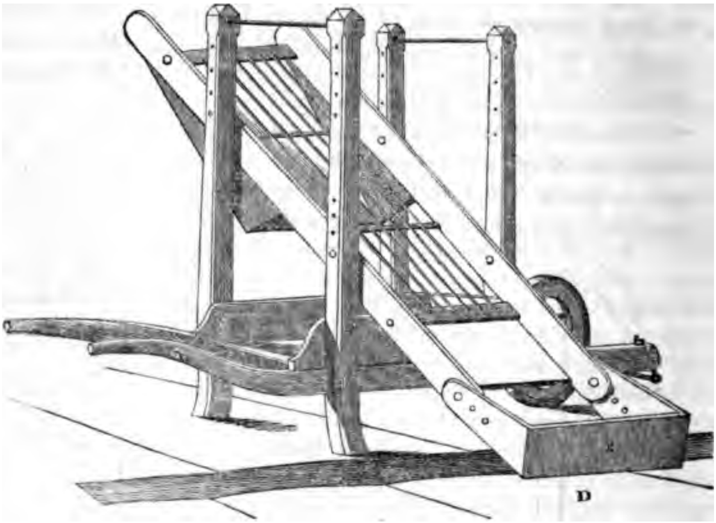
The work is enriched with 16 woodcuts containing plans and views of this very interesting place, two views of the flower garden and pond are peculiarly rich, effective, and well executed, and give a pleasing idea of the ample resources and favourite amusements of the amiable lady to whom those beautiful grounds belong.

"*Kenwood, the seat of the Earl of Mansfield at Hampstead*, is beyond all question the finest country residence in the neighbourhood of London, in point of natural beauty of the ground and wood, and in point also of the main features of art." Eleven woodcuts display the beauties of this seat to much advantage, and the letterpress contains ample descriptions and remarks in the talented author's style.

"If," he says, "it were desired completely to spoil the characteristic beauty of Kenwood, as far as could be done without removing any of the trees, the way would be to place beds of flowers along the terrace walk, and on each side of that walk from the commencement of the terrace to the end of the wood." "Wherever there is no marked expression, or an indifferent or bad expression, flowers and flower beds may be introduced in the foreground of the lawn front. On the other hand, wherever the view from the lawn front has a decidedly marked expression that is agreeable, whether by its grandeur, its picturesque beauty, or its peaceful rusticity, flowers in the foreground ought to be avoided," (p. 669.) "It may be laid down as a general principle, that it is always more or less dangerous to introduce flowers in the foreground, when there is an extensive distance as a termination to the view; and, on the contrary, that, when there is little or no distance, and a view limited in extent, flowers may generally be safely introduced. These remarks will not be without their use, if they induce persons to think before they introduce flowers into particular parts of pleasure grounds where no flowers have been before, and to examine whether flower beds already existing, might not be better removed. (p. 671.)

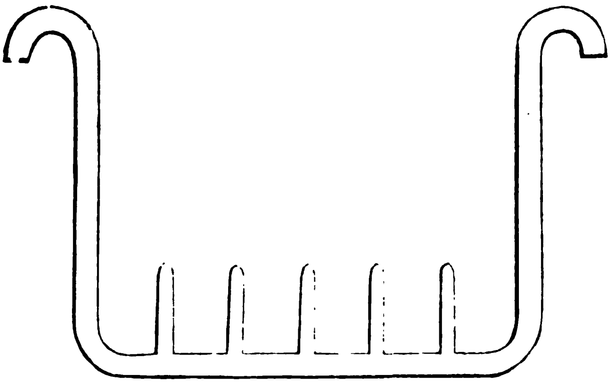
We take much pleasure in perusing any thing written by Mr Loudon on matters of taste, with which this volume is replete. Although we have selected these few extracts on this topic; yet the work abounds with valuable and ample directions of essential importance to the suburban residenter; whether he wishes to purchase or to build, embellish or to manage his establishment. A. G.

Drain-filling Harp.—It not unfrequently happens, that so much earth or rubbish, in some situations, becomes mixed among the small stones destined for drains, that considerable expense is incurred in separating them; and it almost always happens in filling drains with small stones, that many of them are made inadvertently to strike against the sides, and detach portions of earth therefrom among the stones. To avoid both these inconveniences, Mr James Roberton of Ladyrig, near Kelso, Roxburghshire, caused a machine to be constructed, which may be designated a drain-filling harp, such as is represented in the annexed figure. The harp being mounted on a wheelbarrow, is placed on one side of a drain, with its lower end B projecting fully half-way over the drain D. The stones are taken with a fryingpan-shovel out of a cart, on the opposite side of the drain, and thrown upon the harp, down



the inclined face of which they roll, and striking in the inside face of the board B, drop perpendicularly into the drain D, without touching either of its sides; whilst the earth or rubbish that may have been amongst the stones pass through the harp, some striking against its back-board, and drop into the barrow, out of which it is shovelled, and spread on the top of the stones. A small trough is attached, by means of chains and hooks, to the hind part of the cart, for the purpose of receiving any stones that may drop while the workman is shovelling them out of the cart. Mr Roberton found this harp to answer the purpose so well on trial, that no drains are filled now with stones, in his part of the country, without it; and what renders it the more valuable in practice is, that more work can be done with its assistance than otherwise. Of course it should not be used to fill drains with stones above tiles, until a coursing of picked stones has been first carefully placed above them by the hand.

Simple Method of carrying Trees for Transplantation.—By William Glencross, Esq. of Luxtowe, Liskeard. This instrument, by which trees may be carried from one place to another, with the earth adhering to their roots, for the purpose of being transplanted, is very simple in construction, and effective in operation. It consists of a bar of iron, one inch and a quarter in width, and three-eighths in thickness, so bent as represented in the adjoining figure, as that the upright ends shall stand eighteen inches in height, and be one



foot eleven inches asunder, having their ends turned round like hooks. The five teeth, represented as resting on the bottom of the figure, are also of iron, five inches in length, and three-quarters in breadth; but instead of standing vertically as they are represented (which was merely done, in order to shew more distinctly their position, shape and dimensions), they lie in a *horizontal* position, and are securely welded to the bar, flush with its upper face. Two of these instruments, or cradles, as they may be called, are required, and their cost does not exceed seven or eight shillings; as also two poles of hard wood, such as ash, six feet in length, and feruled at the end. Thus provided, the tree fixed on may be removed in this way:—Dig around the plant, at a distance which will encompass the roots, and when at a sufficient depth, put the spade under, gently easing and lifting the whole root, so as to get one of the irons or cradles introduced under the earth and root of the plant, with the teeth looking inwards, and then tap or beat the iron fast with the feruled end of the pole. Having thus adjusted one side, the other may be done in the same manner. The poles are then passed through the hooks of the irons, and the requisite number of men may carry the plant away to its new situation, as if in a sedan-chair, care being taken to have a suitable pit made for its reception, with well-tempered mould. The plant is thus deposited, with scarcely any disturbance, and by *canting* it a little to one side, the irons, one after the other, are easily removed. The *whole* of the earth being permitted to remain about the roots *little* or *no check* is sustained by the plant in its growth, if carried a moderate distance. I have found this mode of transplanting trees very expeditious, and attended with every assurance of success. In my opinion, the principle might be made available for trees of a larger description, with irons equal to the required purpose, assisted by a triangle, blocks and tackle, and a pair of wheels, drawn by a horse or horses, instead of men.

Insects in Provisions.—"Instinct with life."—Widely as insect existence is disseminated through creation, we are daily made aware of it, in unthought of situations. But a few years (comparatively) have elapsed since the generation of insect life was discovered.

Francisco Redi, an Italian physician, born 1627, first disproved the hitherto received opinion, that insects were engendered in putridity. The glorious sun had previously all the honour and credit of paternity. "Common kissing Titan," is his epithet in Cymbeline; and "Hamlet the Dane" exclaims, "For if the sun breed maggots in a dead dog, being a god, kissing carrion," &c. In our time, discoveries in minute creation, are facilitated by means of the microscope; but before the wonders of that instrument were generally known, all investigation and experiment were effected by hard study, patience, close observation, and reflection. Redi brought all these qualifications, with the addition of an ardent love for philosophical pursuits, to his assistance; and great was his reward.

The generality of our readers are probably familiar with the subject of the Italian physician's researches; we shall not therefore occupy their time with any detail of them, but proceed to mention a few facts connected with insect life in situations that may not be extensively known, the existence of which, and methods of destroying the unwelcome and destructive intruders, may interest our farming friends in particular.

In country places, and districts far distant from the convenience of shops, it is requisite to lay in stocks of consumable articles, and every housekeeper must be aware, by sad experience, how many of those articles are liable to the attacks of insects to their injury, and ultimate destruction. We say nothing of the noisy and loathsome blow-fly, which, though useful in causing the removal of putrid bodies, by means of its innumerable offspring, is a pest in our larders; nor need we dwell upon the cheese-fly, and the insidious bacon-fly, which are known to, and their ravages bewailed by all. Every housewife has some remedy for the latter; some case their prime hams in mortar, others in a coating of paste made of flour and water, taking care to avoid all cracks by which the little enemy might gain ingress. Some persons bury their flitches in wood ashes, while many allow them to take their chance; and when they find that "jumpers" are frolicing over their goodly stores, console themselves with this proof of possessing prime bacon, for "it is a sure sign the meat is fine if the fly attacks it!" Flour, wheat, rice, groats, pearl barley, vermicelli, maccaroni, &c., are all requisites in a dwelling, and each has its peculiar assailant. To an unobservant person, the minute insects which make their appearance among the different articles of consumption in our store-rooms, have the semblance of dust. In old rice, for example, the surface is covered with atoms, which a breath will disperse; but in a day or two a fresh progeny of devouring creatures (natives of Carolina or of the swampy grounds of Hindostan) are again consuming our store. On investigating the grains, each is, or will be found to be perforated; and in time the whole would be entirely consumed by them. A difference in the scent of all stores in which vitality exists, is always perceptible.

To say nothing of the waste thus induced, the article is changed,—is unwholesome,—particularly flour, which actually becomes a mass of living things, as any person possessing a microscope of even moderate power of magnifying, may be aware, by placing a small portion of it upon a piece of glass, and looking at it through the instrument. That which seemed flour, will be found to consist of innumerable white transparent insects, in size and form resembling mites in cheese. When flour becomes infected, or rather animated, it is unfit for use, there is no remedy, it ought to be thrown away; for not only is it revolting to feed upon a mass of insect life, but the substance being no longer vegetable, it loses all its properties,—it is changed to animal, and its taste, smell, texture, nutritive properties gone; puddings and pie crust made with it are heavy, having lost its adhesive property, the dough falls apart and has acquired an abominable flavour. We repeat, there is no remedy for this domestic evil; the article must be sacrificed. We can only point out an unerring guide to ascertain when it is in this unwholesome state.

On opening the bin, sack, box, &c. containing the stock of flour, observe the surface, if it look smooth, as if a white dust of a different texture had been cast over it, remove the whole of the upper part carefully, and throw it away (reserving a portion, if desired, for investigation in the microscope), stir it up, and leave it for a day. On again examining it if the same appearance be observed, it will be manifest that the whole of the destructive insects had not been taken away on the preceding day, but that they pervade the whole mass. It is therefore no longer in a fit state to be eaten. With respect to rice, groats, &c., the case is different: we give our own experience as the best guide to others. Having some time since discovered the dust-like appearance before named, to be insects, we sifted the rice through a tin colander, over a large sheet of white paper: the quantity—we literally mean *quantity*, not merely number—of insects was astonishing! Hoping that the evil was thus averted and the enemy destroyed, we replaced the rice in a large jar and covered it. In a few days we found that a horde had again taken possession, and that each grain was injured, eaten half away. We therefore resolved to sift it once more, and then to submit the grain to a degree of heat that would doubtless destroy vitality whether in its perfect or its embryo state. We placed the rice in a number of shallow vessels, tin dishes, plates, &c., so that it should present a thin surface, in order that the heat might penetrate immediately in every part, and placed the vessels in a brick oven as soon as the bread was drawn, while the temperature was yet high enough to destroy the germ of life without scorching the grain. In three minutes we withdrew the dishes, &c., turned and stirred the rice, and replaced them for another three minutes, then turned it out on a clean kitchen dresser, spread it thin, and left it to cool; when *quite cold* we replaced it in its receptacle, and purposely retained it *for many months*, that we might watch the effect. Our plan succeeded entirely. Not a hint of insect life ever again appeared. Nor was this the only fortunate result of our experiment; that very grain, which would have been entirely consumed by, and converted into, countless myriads of insects, became so much benefited by the fiery ordeal to which it had been exposed, that it required little more than half the time in boiling; and acquired a richness of flavour before unknown.

Our gratifying success, induced us to make trial of other stores, and we have submitted groats, vermicelli, &c. to the same remedy, when similarly affected, and with the same results. This statement is clear,—the trial easy,—the remedy exceedingly useful. To small shopkeepers, the knowledge of this simple fact would be invaluable. The *trouble* that attends it (and which would deter many housekeepers, to whom the loss of a few pounds of various stores might be no object in comparison), would to a country shopkeeper be no impediment; the whole of their employment is "a trouble" of a similar nature; their subsistence depends on the sale of goods,—these goods must be in a saleable condition,—they retain and pay assistants whose time is frequently unemployed,—they generally possess a brick oven; or if not, a baker's oven contiguous might with facility be resorted to, which, being on a larger scale than those that are fitted for a private family, would be better adapted for the purpose; here, for a trifling remuneration, the proprietor (or some confidential person) could attend with his goods, watch the progress of his experiment, and in the course of a few minutes find his wasting and decaying stores converted into wholesome saleable articles;—moreover improved in flavour, and rescued from future deterioration.

Nor are the above-named household matters the only unconsumable articles that become infested with a destroyer "whose name is legion;" jams, jellies, and other preserves, are preyed upon by a little creature so minute as to escape detection without the aid of a microscope; having more the appearance of incipient candying, or fine white sugar sprinkled upon the surface, and over the jars. Minute though it be, whenever it makes its appearance, the scent of the preserves is entirely altered; a faint stale odour pervades them, that is exceedingly unpleasant. We have known this unwelcome visitant to make its appearance within a month after our stock of jellies had been finished. We have had them reboiled, and in a few days a fresh progeny had taken possession of the sweets. Nothing remained then, but to boil again, to have the shelves scoured, the jars washed in hot water, and to submit the paper coverings and the strings with which the jars were tied round, to the action of strong heat in an oven for some minutes; and this effectually destroyed the nuisance.

It is evident that all grain intended for household consumption can be readily preserved; but that all meal is less easily kept from the attacks of insects, and is with greater difficulty recovered from the deterioration. We incline to think that the vast superiority of Scotch oatmeal over that which the unfortunate "southerns" obtain from English millers, and the great length of time during which the former will remain sweet and good compared with the latter, which will keep useable only a fortnight, is attributable to the method of kiln-drying that the Scotch millers adopt, which not only destroys incipient (or perhaps actual) insect vitality, but imparts that richness of flavour which is wholly deficient in English oatmeal. In fact, the mealmen of the south confess they know not how to give the same appearance, taste, scent, or texture to their oatmeal, that is so apparent and so delicious in that of Scotland.

We are firmly of opinion that if wheat could be subjected to a similar process to that which is adopted for oats, the results would be the same; namely, that it would keep a much greater length of time, it would be secured from insects, its flavour would be highly improved in richness and delicacy, it would be decidedly more wholesome, and would require much less time in cooking. Our reasons for speaking thus positively arise from actual demonstration. It is well known that flour from wheat is rejected altogether by the dyspeptic, "because it lies heavy on the stomach," "because it turns sour," because it ferments," "because"—twenty other reasons; therefore it is not a fit aliment for young children, where from ill health, or fortuitous circumstances, a mother is unable to nurse her offspring, and recourse is to be had to extraneous nourishment. Every succedaneum with which we are acquainted, has been tried for the food of infants, and not any is so entirely free from objection as this very contemned *wheaten flour*, when it has undergone the process of either baking or boiling for the space of a couple of hours. All crudity is subdued,—it becomes a compact hard mass, which is to be rolled or grated, when wanted for use,—requires merely heating, not even boiling, to make it palatable, and is in flavour really delicious; it is also light, nourishing, free from all those objections made by the dyspeptic, and moreover will keep free from insects, shall we say *for ever?* if we do, our readers will see that we mean an indefinite period. We have at this time some groats, which (as every mealman and housekeeper is aware) is a grain very liable to insect; we detected some of the assailants more than six months since, and immediately placed the groats in an oven by the side of the fire for about five minutes; as we before asserted, they are improved in flavour, and have remained entirely free from insects; had we left them to the depredators, not one grain would by this time have remained.

Farmers versus Rooks. By James Stewart Menteath, Esq. —It seems in July 1807 a motion was made in the Agricultural Association for Ayrshire, "That the Association use its influence to induce the proprietors of rookeries to exterminate or greatly reduce their rapidly increasing numbers;" which motion was supported by petition numerously signed, carried at a meeting in the following October, and a committee "appointed to draw up a statement of the injuries sustained by the petitioners." The committee in due time presented a report, containing, amongst others, these facts: That on a farm of an hundred acres, two herd boys are necessary to be kept to use fire-arms to keep off rooks and wood-pigeons: that these boys receive L.2 or L.3 a-year of wages, which, with their maintenance at 2s. 6d. a-week, a sum of not less than L.20 a-year is entailed on the farmer;—that, on account of the depredations of those birds, an additional quantity of grain must be sown to meet the deficiencies occasioned by them, that quantity not being worth less than L.3 a-year for wheat alone;—that besides the injury done to the grain crops, these birds greatly injure the turnip and potato crops, by pulling up the plants of the former, and digging up and carrying away the sets of the latter.

Were the object of the farmers of Ayrshire in making the request to the proprietors, wholly to exterminate the rooks and wood-pigeons, they would fail, so long as these birds were permitted to breed unmolested in other parts of the country; but were they to succeed in that particular wish, they would certainly suffer by the increased depredations of insects. The *extermination* of rooks would be no easy task, for as we heard

Lord Panmure remark when a similar proposition was brought before the Eastern Forfarshire Farming Association, that the battle of Waterloo would be but a trifling skirmish compared to the firing that would dislodge the rookeries at Panmure. But, notwithstanding this pugnacious display of the farmers of Ayrshire against the rooks and wood-pigeons, there is no doubt *they* are aware, as well as all persons must be who live constantly in the country, that rooks do good, negatively though it be, as well as harm,—that they destroy insects, and thereby prevent *their* doing injury, as well as destroy white and green crops. The rook question is thus reduced to a balancing of accounts betwixt them and the farmer. The Ayrshire farmers, and we must admit farmers generally, assert that the balance is in their favour against the rooks, and the advocates of the rooks assert the contrary. Among the latter class of disputants is Mr Menteath, in the brochure which he has published with the title placed at the head of this article, and occasioned by the measures of the Ayrshire farmers related above; and he has produced a large mass of evidence, chiefly from writers on natural history, to shew that the turnip-fly, cockchafer beetle, wireworm beetle, crane-fly, and slugs injure the cultivated plants, and that the rooks devour these for their ordinary food.

We conceive it to be an error to suppose that rooks confine themselves to any species of food; they are neither carnivorous, granivorous, or herbivorous, but omnivorous, devouring in each season the kind of food they can obtain in the greatest quantity. In spring they maintain their callous brood *solely on insect food;* to obtain which they will follow after the ploughman in the furrow close to his heels,—will turn over every clod assiduously in search of insects on new harrowed land; will traverse lea fields patiently in search of worms, which they carefully extract from the ground with their bills, and deprive of earth before swallowing them, by stripping them through their toes. In summer, after the brood can shift for themselves, they go in search of other kinds of food; they will carry off the eggs which the poultry may have carelessly laid in exposed situations; they will devour cherries and geans on standard trees in quantities; they will dig up the germinated sets of potatoes, and that not solely for the purpose of obtaining insects or slugs, for they carry them off entirely to a retired situation and there devour them; they will fly many miles to the hills every day in order to feed on wild berries; they will pick up portions of food given to fowls and pigs, such as boiled potatoes, roots and scraps of any kind; they will peck pieces of carrion from putrefying carcasses of horses and dogs, as well as the insects that may have been engendered in them, or in the droppings of horses and cattle. In autumn they are ever ready to descend upon the earliest fields of barley or wheat, and especially upon the laid spots, not merely to feed on the yet soft grain, but to scatter with their bills, and scratch with their feet, much more of the grain than they can consume for sustenance; and until the crop is wholly carried in and secured, they are constant attendants on the corn-fields, on laid grain, on light hillocks, where the straw is short, on the tops of stooks, and on the ground, after it is cleared, in search of malted gleanings. At this season they are always plump and sleek with fatness. In winter they are frequently ill off for food;—they may often be seen as described by Cowper,

"......... perched aloft
By the wayside, or stalking in the path,
Lean pensioners upon the travellers' track."

And, during severe storms, many of the oldest, no doubt, pay the debt of nature, and those who escape are reduced to little better than a bunch of feathers. In their desperation, they will scratch down the dunghills that may have been led out in the fields,—they will pick holes into turnips in the fields, and get access to them by scratching away the snow,—they will stalk boldly about the steading, and, in combined bands, make attacks upon the thatch of the corn-stacks, and, if unmolested, will certainly succeed in opening their way to the corn.

This is the annual course of life pursued, not by the carrion crow, but the rook; and, when its circumstances are duly considered, it cannot be denied that much damage is inflicted by rooks on the farmers when they happen to be fostered in large rookeries, and thereby become excessively numerous. Attempts to check their increase within proper bounds cannot therefore be characterized as cruel towards those birds, or founded on ignorance of their habits, or suicidal to the interests of the farmers themselves. How the attempts should be made, whether by means of gunpowder, or the pulling down of nests, is a secondary consideration, and must be proceeded in according to convenience. It is enough for the farmer to know that rooks commit sensible depredations, to justify reasonable attempts being made, not to "exterminate" them, for that would be both impossible and suicidal, but to "greatly reduce their rapidly increasing numbers," when they are found to be so increased. It may be true that rooks, in pulling up young turnip plants—and we have seen five acres pulled up by them in one field—and in carrying off potato sets, that they do so in search of insects, worms, and slugs, and that they never enter a field, as is alleged, with the view of injuring the crops; but we conceive it matters little tothe farmer whether his crops are destroyed by intention or otherwise. The sçope of much of the evidence adduced by Mr Menteath, countenances the suppression of their numbers within moderate bounds, and admits the depredatory tendency of their visits. "Unquestionably," says the Rev. W. T. Bree (p. 16), "they commit some little injury, particularly when impelled by necessity, during the time of dry weather, when grubs penetrate much deeper into the earth than usual, and the common earthworm rarely makes its appearance." "But then," continues he, "by way of compensation, they do a vast deal of good." "Only let the balance be fairly struck," he adds, "and the good they do will be found greatly to preponderate." Were this opinion of the reverend writer universally adopted, the rook question would be settled for ever, and no more motions would be made, committees formed, and reports drawn up in agricultural associations. Admitting the full force of this opinion, there are calculations made by subsequent witnesses, which sanction the partial destruction of rooks. In the first place, the numbers of insects that may be found in the ground, as instanced by the grub of the crane-fly (*Tipula oleracea*), commonly known by the names of Tommy-longlegs, Jenny the Spinner, Jenny Nettles, which is stated by Mr Jesse to have been found to the amount of 60 under a square foot of turf (p. 22). A family of rooks is said by a correspondent, at p. 24, to consume 3847 caterpillars of that very insect in one day, that is in a year 1,404,155. "*Supposing*," he only makes a supposition in the case of the destructive powers of the insect, though he appears to have ascertained the exact number of caterpillars destroyed by a family of rooks, "a caterpillar to destroy as many wheat or other plants as might grow upon a space of ground equal to nine inches square. *a family of rooks would preserve from destruction more than two acres of corn.*" It should be remembered that before this destruction of wheat could be effected, or the rooks could have prevented it, the sixty caterpillars found in any square foot, would have had to spread themselves, in the field, over sixty spaces of nine inches square each. Here is another *supposition.* In a certain rookery in Yorkshire, "it is estimated there are 10,000 rooks; that one pound of food a-week is a very moderate allowance for each bird, and that nine-tenths of their food consists of insects, worms, grubs, and caterpillars. . . . . . . Here, then, if my data be correct, there is the enormous quantity of 468,000 lbs., or 200 *tons of worms, slugs, grubs, caterpillars, and insects destroyed by the birds of a single rookery*," (p. 25). Let us examine how both these *suppositions* coincide. We have seen that "a *family* of rooks," meaning, of course, four rooks, preserves *two* acres of corn. The 10,000 rooks constitute 2500 families, which should preserve 5000 acres of corn. We have also seen that a family of rooks consumes 3847 grubs in one day, or 26,929 in one week. Now, as one pound of food is sufficient for one rook in one week, 6732¼ grubs will weigh one pound weight. But the rookery of 10,000 rooks consumes 468,000 lbs. of grubs, or, according to the above data, 3,231,480,000 grubs. Now, as we have further seen, that each grub consumes "wheat that might grow over a space of ground equal to nine inches square," and as an imperial acre contains 6,272,640 square inches, it follows that "*the birds of a single rookery*," (p. 25) must have preserved 41,870 acres, when it appeared from the first supposition they were expected to clear only 5000 acres. So will men distort facts, and commit discrepancies, to support a favourite theory.

But in the midst of the exploits of the rooks, we have been overlooking the culpability of the wood-pigeons. Not one voice has been raised in their favour, and if there were, no credence would be given to it; for a more mischievous bird to the farmers does not exist in this country. Wood-pigeons have increased immensely these last few years, and confident in their numbers, they have almost abandoned their former shy habits. They pick down the young clover in spring; they almost demolish the pea crop, and seriously injure the early wheat, which they beat down by alighting on it; they pick off the young leaves of turnips, sometimes bare, and in winter they pick large holes into the turnips, particularly the Swedish. We know of no effectual mode of destroying them.

Effects of Pulverization. By Mr Robert Arthur, Edinburgh.—In a field of clover lea, at Balgone, East Lothian, the property of Sir George Grant Suttie, an acre of land was ploughed three successive times, by way of rag fallow, an equal portion of the same field being only once ploughed, both were sown with oats at the same period, and on reaping and weighing their respective produce, the rag fallow yielded 224 stone of corn and straw more than the other.

Upon the same farm, Mr Scougall, the overseer, showed me an ear of oats bearing 451 grains, and another 350—several stools, with upwards of twenty stems above seven feet in height—one in particular of uncommon luxuriance, having twenty-four stems, and numbering upwards of 4700 grains! The above extraordinary specimens were produced from a field of very old pasture land recently broke up.

QUARTERLY AGRICULTURAL REPORT.

November 1838.

What with the unfavourable nature of the weather,—the rise in the price of corn,—and the operation of the corn-laws affecting, and still likely to affect, the interests of the farmer, until the state of the next year's crop is fully ascertained, we feel considerable difficulty, at the present moment, of expressing a confident opinion on agricultural matters relating to the future prospects of the farmer. Two things, however, are pretty certain: that the season throughout has been very unfavourable to the fruitfulness and maturation of every kind of crop; and that, in consequence, every kind of grain is deficient in quantity, and inferior in quality. In any late season, such as this has been, it is quite impossible that grain should be of *good* quality, however great the quantity may be; but the variableness of the weather sometimes affects places differently. We are assured, for instance, that no kind of crop, even this year, has failed much in quantity or quality in Roxburghshire and Northumberland; and we have no doubt, that in every place where a soil of good stamina rests on an open subsoil, the same result will be experienced. We have also been assured, that, in the country around London, particularly to the eastward and southward, the summer was so dry, as to occasion the want of water to be felt; so in that district we may expect wheat of fine quality. In like manner, it has been stated, that the weather was good in the southern portion of Ireland for the greater part of the summer, though the reports of the agricultural matters of that country are not always to be implicitly relied on. But these instances are exceptions to the general state of the crop. In the lowland districts, the grains, including the beans, have been carried in, we may say, safely, for some weeks. The weather proved remarkably propitious for the ingathering of the lowlands. In the mountainous districts, on the other hand, the grain, ripened by the frost and neglected by the sun, is no more than carried in. The poor inhabitants of those poor districts cannot fail this year to feel the pinching wants of famine. In addition to the chilling effects of wet and cold, a tempestuous hurricane from the west swept across the face of the country on the evening of the 11th October, and in the short space of three hours, thrashed the standing corn, blew stooks from one field into another, threw down stacks, swept the produce of whole fields into the sea, in Kincardineshire, and uprooted and unbranched trees that had stood the brunt of the elements for two hundred years. Fortunately, the crop in the most valuable parts of the country was secured before this onslaught, or the damage sustained by it would have been incalculable. We regret having to give so poor account of the crop 1838; but still, not knowing what is generally meant by an average crop, unless it signifies one that supplies the wants of the inhabitants, we have not the least doubt there is enough of produce to support our own inhabitants in Scotland to the ordinary period of another harvest.

To descend into particulars, the grains are all rough in quality. The wheat proves roughest and most deceptive in yield of grain, to the bulk of straw; one instance having been mentioned to us as not exceeding 9 bushels per imperial acre. We suspect very few samples will reach 60 lb. per bushel. Barley is also proving deceptive in yield to the bulk of straw, especially from strong soils. Oats from good land are good; though perhaps not fine, and they will certainly approach in yield nearest to their appearance in bulk. Beans, liking a dropping season, may turn out a moderate crop. Potatoes vary much both in yield and quality.

Those on light soils are of good quality, and not very deficient in quantity; but on the stronger soils quite the contrary. We have heard the yield stated as varying in Perthshire, the principal county for potatoes, from 100 bushels to 360 bushels per acre imperial. Turnips are generally a bad crop, excepting those early sown on true turnip soils. It may be laid down, as a general rule in this country, that late sown turnips will not thrive; and this season, to the loss of the farmer, the seed could not get early into the soils in most situations. The hay was a rather abundant crop, and cheap in price in summer, but now as high as one shilling per stone of 22 lbs., on account, we believe, of the deficiency of turnips, the high price of corn, and the apprehended want of nutriment in the straw, though we remarked the peculiarly rich colour of the straw of the early ripened crops. Pastures, for the want of after-growth, became very bare in autumn, before the stubbles were cleared for their relief. Fat stock have maintained a pretty good and equable price. Young stock are lean, and sold at low prices at the Falkirk Trysts in September and October; but by the period of All Hallow Fair, they realized a good and ready demand. The prices of all kinds of agricultural produce are high at present, as may be seen on referring to the annexed tables; nor is the prospect of a considerable decline, for some time to come, at all clear.

The subject of prices naturally leads the mind to the operation of the corn laws. It appears to us a strange perversion of judgment, in the political economists, to clamour *against* the corn laws at the very time they are permitting the entrance of foreign corn into our markets duty free, and yet remain silent as long as they completely prohibited the importation of foreign corn. To pass the gentlest opinion on such conduct, we must say the time for *attempting* to raise a clamour against them,—for they could not succeed in raising one, as the people are daily becoming better informed in regard to the real effects of the protection afforded to agriculture on their own interests,—was ill chosen. Till this season, the corn laws have had no opportunity, since their enactment, of performing one branch of their duties. Hitherto they have succeeded in protecting our farmers against the competition of foreigners, but the graduated scale of duties has proved its intrinsic value, and when called into action, as it has been this season, it must be confessed it has worked its problem well. It is no doubt true, that the average prices of grain were very much affected by the operations of the speculators in foreign grain; and that those operations raised those prices to a higher pitch than they would have reached merely from the natural effects of the deficient crop; still it should be borne in mind, that the corn laws were *purposely framed* to encourage corn-merchants to speculate in foreign corn, so that a large supply might be always at hand in case of need; and the very circumstance of nearly 1,500,000 quarters of wheat, of the very best quality, having paid the duty, and of course free, for home consumption, during the last quarter, at a time when the wheat of home growth is of acknowledged inferior quality, is an unequivocal proof of the judiciousness of the construction of the corn laws; and at the same time it should become a motive for gratitude, instead of vituperation, to those men who can supply us with grain of the finest quality, and of course of the most wholesome nature, as we require it. We are aware there are many persons really friendly to the protection of our agriculture, who are nevertheless hostile to the present graduating scale of duties, because that those duties afford too scanty protection to our farmers, in years when the prices of grain may rise to a high pitch from a deficiency in home grown corn; and they illustrate their opinion by appealing to our common sense, whether a *fixed* duty would not have afforded a more effective protection this year than the graduating duties, which may be, and have been, made subservient to the purposes of the speculators. Could a high fixed price, say 20s. per quarter for wheat, be *permanently* maintained, and always exacted, the reasoning regarding the superiority of fixed duties might be quite true. But it is obvious, from the temper of the times, and the prevailing influence of the manufacturing interest in Parliament, that a duty above 5s. a quarter could not be obtained; and rather than open the question of fixed duties in the present feverish state of public feeling, it is much wiser for the agricultural interest to refrain from exhibiting differences of opinion among themselves on the laws that avowedly afford them a general protection in their present form. Had a fixed duty of 20s. existed before the last harvest, it would inevitably have been placed in abeyance months ago, and probably have continued for months to come, by an Order in Council, by the present men in power.

THE REVENUE.

ABSTRACT of the Nett Produce of the Revenue of Great Britain, in the Quarters and Years ended on the 5th of October 1837, *and 5th October of* 1838,—*shewing the Increase and Decrease on each head thereof.*

	Quarters ended Oct. 5.		Increase.	Decrease.	Years ended Oct. 5.		Increase.	Decrease.
	1837.	1838.			1837.	1838.		
	£	£	£	£	£	£	£	£
Customs, ..	5,436,116	5,459,271	33,155	..	18,372,944	18,823,619	450,675	..
Excise,....	3,705,467	4,093,959	388,492	..	12,007,238	11,827,788	..	179,450
Stamps,...	1,622,252	1,751,476	129,224	..	6,461,282	6,636,204	174,922	..
Post-Office,	418,006	410,000	..	8,006	1,490,743	1,536,000	45,257	..
Taxes,....	308,092	328,045	19,953	..	3,693,380	3,647,157	..	46,223
Miscellaneous,	2,701	8,376	5,675	..	44,635	44,781	146	..
	11,492,634	11,971,127	576,499	8,006	42,070,222	42,515,549	671,000	225,673
	Deduct Decrease,		8,006		Deduct Decrease,		225,673	
	Increase on the quarter,		568,493		Increase on the year,		445,327	

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the Quantities Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month; the Quantiti upon which duties have been paid for home-consumption, during the same Month; and the Qua tities remaining in Warehouse at the close thereof, from 5th August to 5th November 1838.

Month ending	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN WAREHOU		
	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	To
Aug. 5. 1838.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs.
Wheat, .	94,237 5	0 2	94,237 7	2,500 6	3,570 5	6,071 3	668,611 6	1,542 4	670,1
Barley, .	236 0	..	236 0	468 7	..	468 7	23,364 6	..	23,3
Oats, . .	1,487 7	3 0	1,490 7	16 3	3 0	19 3	235,197 2	..	235,1
Rye, . . .	..	..	..	..	..	..	5,122 5	..	5,1
Pease, . .	1'613 1	..	1,613 1	132 5	..	132 5	21,783 2	..	21,7
Beans, . .	16,671 1	..	16,671 1	165 5	..	165 5	33,762 4	..	33,7
Totals, .	114,245 6	3 2	114,249 0	3,284 2	3,573 5	6,857 7	987,842 1	1,542 4	989,3
Sept. 5.									
Wheat, . .	241,237 7	..	241,237 7	10,890 1	1,555 0	12,445 1	873,926 0	299 3	874,
Barley, . .	340 6	0 4	341 2	1,280 1	0 4	1,280 5	18,948 0	..	18,
Oats, . .	7,455 5	..	7,455 5	91 0	..	91 0	236,519 3	..	236,
Rye, . . .	..	..	..	..	..	..	5,322 5	..	5,
Pease, . .	6,570 6	0 4	6,571 2	33 5	0 4	34 1	28,562 1	..	28,
Beans, . .	8,104 5	..	8,104 5	483 5	..	483 7	40,979 6	..	40,
Totals, .	263,709 5	1 0	263,710 5	12,778 6	1,556 0	14,334 6	1,204,257 7	299 3	1,204,
Oct. 5.									
Wheat, . .	536,647 4	...	536,647 4	1,444,520 1	150 3	1,444,670 4	2,199 5	172 4	2,
Barley, . .	775 4	..	775 4	5,315 0	..	5,315 0	12,524 7	..	12,
Oats, . .	16,311 7	0 6	16,312 5	6,416 2	0 6	6,417 0	241,417 3	..	241,
Rye, . . .	..	..	..	1 7	..	1 7	5,322 5	..	5,
Pease, . .	3,747 4	..	3,747 4	326 2	..	326 2	32,127 2	..	32,
Beans, . .	20,653 3	..	20,653 3	11,908 0	..	11,908 0	49,118 2	..	49,
Totals, .	578,135 6	0 6	578,136 4	1,468,487 4	151 1	1,468,638 5	342,710 0	172 4	342,
Aug. 5. 1838.	cwt. qr. ℔	cwt. qr. ℔	cwt. qr. ℔	cwt. qr. ℔	cwt. qr. ℔	cwt. qr. ℔	cwt. qr. ℔	cwt. qr. ℔	cwt.
Flour, . .	28,173 1 7	3,129 1 11	31,302 2 18	2,037 2 22	10,594 0 26	12,631 3 20	114,779 2 3	2,248 1 16	117,
Oatmeal, .	8 1 18	..	8 1 18	..	..	..	424 3 4	..	4
Totals, .	28,181 2 25	3,129 1 11	31,311 0 8	2,037 2 22	10,594 0 26	12,631 3 20	115,204 1 7	2,248 1 16	117,4
Sept. 5.									
Flour, . .	55,802 0 1	9,004 1 10	64,806 1 11	1,764 1 23	6,797 1 11	8,561 3 6	155,146 2 19	4,455 1 15	159,
Oatmeal, .	1,113 1 4	..	1,113 1 4	1 2 27	..	1 2 27	375 3 3	..	
Totals, .	56,915 1 5	9,004 1 10	65,919 2 15	1,766 0 22	6,797 1 11	8,563 2 5	155,322 1 22	4,455 1 15	159,
Oct. 5.									
Flour, . .	97,983 1 24	2,743 2 26	100,727 0 22	252,187 1 21	2,743 2 26	254,931 0 19	7,676 1 22	4,643 1	12,3
Oatmeal, .	1 2 0	..	1 2 0	1 2 0	..	1 2 0	276 1 25	..	2
Totals.	97,984 3 24	2,743 2 26	100,728 2 22	252,188 3 21	2,743 2 26	254,932 2 19	7,952 3 19	4,643 1 0	12,

PRICES of BUTCHER-MEAT.

	SMITHFIELD, *Per Stone of* 14 ℔.		MORPETH, *Per Stone of* 14 ℔.		EDINBURGH, *Per Stone of* 14 ℔.		GLASGOW, *Per Stone of* 14 ℔.	
Date.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
1838.								
Aug.	6/9 @ 7/9	7/3 @ 8/3	6/6 @ 7/6	6/6 @ 7/6	6/ @ 7/3	6/3 @ 7/6	6/6 @ 7/6	6/3 @ 7/3
Sept.	6/6 7/6	7/ 7/9	6/3 7/3	6/6 7/3	6/ 7/	6/3 7/3	6/3 7/3	6/ 7/
Oct.	6/6 7/3	6/6 7/6	6/ 7/	6/3 7/3	6/ 7/3	6/6 7/3	6/ 7/	6/ 7/

PRICES of English and Scotch WOOL.

ENGLISH, per 14 ℔.—*Merino*, 26/6 @ 28/6; in Grease, 16/ @ 21/6.—*South Down*, 18/6 @ 23/6; *Leicester*, Hogg, 18/6 @ 23/; Ewe and Hogg, 17/6 @ 20/.—*Locks*, 10/6 @ 14/; *Moor*, 8/ @ 12/6.

SCOTCH, per 14 ℔.—*Leicester*, Hogg, 16/ @ 23/; Ewe and Wether, 15/ @ 21/.—Ewe, 11/6 @ 16/6; *Cheviot*, White, 17/ @ 20; Laid, Washed, 12/ @ 15/; Unwashed, 10/6 @ 12/; *Moor*, White, 8/ @ 10/6; Laid, Washed, 7/ @ 9/6 Unwashed, 6/ @ 7.

TABLES OF PRICES, &c.

The Average Prices of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets:—

LONDON.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1838.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Aug. 3.	71 2	33 4	23 2	36 4	35 6	35 7
10.	72 7	34 1	23 2	36 6	35 11	36 6
17.	74 9	35 3	24 2	37 3	36 4	37 10
24.	76 8	35 10	24 3	37 6	36 6	39 1
31.	74 7	34 7	24 1	38 4	37 8	39 5
Sep. 7.	71 4	32 6	24 4	38 6	37 2	38 5
14.	65 2	32 7	22 11	38 7	38 1	38 4
21.	63 9	34 2	22 11	38 2	38 6	37 10
28.	65 3	34 11	23 1	38 5	39 4	37 3
Oct. 5.	67 1	34 8	23 2	37 7	40 0	36 10
12.	67 8	33 7	23 0	36 6	39 9	35 8
19.	66 9	32 11	23 1	35 6	39 6	36 7
26.	67 0	33 2	22 10	35 10	38 8	35 5

DUBLIN.

Date.	Wheat Per Bar. 20 St.	Barley Per Bar. 16 St.	Bear Per Bar. 17 St.	Oats Per Bar. 14 St.	Flour Per Bar. 9 St.
1838.	s. d.	s. d.	s. d.	s. d.	s. d.
Aug. 3.	43 2	15 6	14 10	13 8	23 0½
10.	43 0	15 10	15 6	14 6	24 8
17.	43 6	16 8	14 4	13 10	25 6
24.	43 8	17 6	14 2	14 6	27 0
31.	44 3	18 6	12 10	13 7	26 6
Sep. 7.	36 4	16 10	12 1	13 2	24 6
14.	30 8	16 6	12 5	11 11	23 0
21.	31 7	15 2	12 9	11 8	22 6
28.	33 1	15 9	12 6	11 2	21 9
Oct. 5	35 6	15 2	12 4	11 2	21 6
12.	34 0	15 7	12 6	11 6	21 8
19.	34 9	15 4	12 9	11 6	22 7
26.	34 9	17 0	13 9	11 10	23 4

LIVERPOOL.

Date.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1838.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Aug. 3.	71 7	33 4	22 5	37 1	35 8	40 6
10.	72 5	33 10	23 4	37 6	36 7	41 0
17.	77 5	39 4	24 1	36 10	36 6	43 0
24.	79 5	34 7	26 9	38 2	37 6	44 0
31.	76 3	33 7	24 8	40 1	38 2	43 9
Sep. 7.	73 5	36 2	24 3	40 6	38 6	42 6
14.	69 4	30 4	21 2	37 4	37 0	45 2
21.	67 2	30 1	21 5	36 10	39 6	43 7
28.	66 1	33 6	21 9	36 4	37 6	44 2
Oct. 5.	64 9	28 10	22 9	36 0	38 6	43 10
12.	62 8	31 5	23 4	35 6	39 8	43 5
19.	65 1	31 2	22 4	35 8	38 10	43 4
26.	67 4	32 0	22 2	36 6	39 2	44 10

EDINBURGH.

Date.	Wheat.	Barley.	Oats.	Pease.	Beans.
1838.	s. d.	s. d.	s. d.	s. d.	s. d.
Aug. 1.	80 6	41 9	28 10	41 8	42 6
8.	82 0	42 3	29 6	42 6	43 0
15.	86 0	42 0	30 4	42 0	42 6
22.	80 0	42 0	31 0	42 3	42 9
29.	78 6	35 0	30 6	42 6	43 0
Sep. 5.	77 8	36 0	30 10	42 9	43 6
12.	76 6	35 0	30 1	42 6	43 2
19.	77 0	33 2	31 1	42 8	43 3
26.	75 0	32 6	29 10	43 6	44 0
Oct. 3.	69 8	32 0	29 8	44 0	44 6
10.	66 3	31 6	24 0	43 2	43 8
17.	62 6	34 3	24 8	43 6	44 2
24.	71 6	35 6	24 9	43 0	43 6

TABLE shewing the Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. IV. c. 58, and the Aggregate Averages which regulate the Duties payable on FOREIGN CORN; the Duties payable thereon, from August to November 1838.

Date.	Wheat.			Barley.			Oats.			Rye.			Pease.			Beans.		
	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.
1838.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Aug. 3.	69 11	68 5	16 8	32 9	31 11	15 4	23 0	22 10	13 9	37 1	36 1	15 6	35 2	35 7	16 9	38 10	37 [illegible]	14 0
10.	71 8	69 2	13 8	33 5	32 3	13 10	23 3	22 11	13 9	37 3	36 3	15 6	37 6	35 11	16 9	38 8	37 11	14 0
17.	75 7	70 7	10 8	34 5	32 8	13 10	24 2	23 2	12 3	36 8	36 8	15 6	35 11	35 8	16 9	40 4	38 4	12 6
24.	77 8	71 11	6 8	34 6	33 2	12 4	24 9	23 6	12 3	40 0	37 7	14 0	37 6	36 0	15 6	41 10	39 1	11 0
31.	74 5	72 11	2 8	34 6	33 7	12 4	24 3	23 8	12 3	40 11	38 6	12 6	38 2	36 5	15 6	41 7	39 5	11 0
Sep. 7.	70 2	73 2	1 0	34 2	34 [illegible]	10 10	24 1	23 11	12 3	36 11	38 7	12 6	37 0	36 11	15 6	41 2	40 3	9 6
14.	64 2	72 9	2 8	32 7	33 11	12 4	22 8	23 10	12 3	36 11	38 6	12 6	38 3	37 5	14 0	40 1	40 [illegible]	9 6
21.	61 10	70 7	10 8	32 2	33 9	12 4	22 9	23 9	12 3	36 4	38 5	12 6	39 2	37 9	14 0	39 7	40 9	9 6
28.	62 11	68 7	16 8	31 11	33 4	12 4	22 7	23 6	12 3	34 0	37 7	14 0	40 3	38 5	12 6	39 9	40 6	9 6
Oct. 5.	64 9	65 5	20 8	31 11	32 10	13 10	22 [illegible]	23 2	12 3	34 4	36 7	15 6	40 0	38 10	12 6	41 0	40 5	9 6
12.	66 0	65 0	21 8	31 5	32 4	13 10	22 7	22 11	13 9	34 3	35 6	16 9	41 1	39 4	11 0	39 1	40 6	9 6
19.	65 7	64 3	22 8	30 8	31 9	15 4	22 5	22 8	13 9	34 11	35 2	16 9	40 8	39 11	11 0	39 2	39 7	11 0
26.	66 7	64 3	22 8	31 1	31 6	15 4	22 4	22 7	13 9	32 9	34 6	18 3	41 2	40 5	9 6	38 10	39 5	11 0

THE
QUARTERLY
JOURNAL OF AGRICULTURE.

ON THE AGRICULTURE OF THE COUNTY OF KILKENNY.

THIS fine portion of Ireland, on the southern limit of the province of Leinster, contains, according to the Ordnance survey, of arable 417,117, and of bog and mountain 96,569, statute acres. King John was the first British sovereign who formed it into a county consisting of nine baronies. According to our ordinary system, we shall describe each of these separately, and begin with the poetically sounding *Fassadineen*, on the northern extremity, which, in spite of its euphonious name, has some of the worst soil in the county, being moory turf of two or three inches thick and an argillaceous subsoil, which being rarely or very imperfectly drained, is of course exceedingly wet, until the heat of the summer's sun evaporates the winter's accumulation of moisture; yet, notwithstanding the want of draining, and the application of lime, which can be had in abundance in the adjacent parts of the county of Carlow, a considerable number of milch cows and young cattle are supported and raised here.

This district is remarkable for its coal-beds, which were accidentally discovered about one hundred years ago, when workmen were employed in raising iron-ore, which is still found there, though not smelted. These have been worked with more or less of energy ever since, and have been a rich mine of wealth to the Wandesforde family, of whom the Hon. Charles Butler Clark Wandesforde, brother of the late excellent Marquis of Ormonde, is the possessor. This proprietor has a very beautiful residence close to the thriving and picturesque town of Castlecomer (where the rebels were engaged and defeated in a battle during the insurrection of 1798, but not before they had committed sad dilapidations in the streets), which for a long series of years was the favourite abode of the late Countess-Dowager of Ormonde, who expended her princely fortune in improvements, and in acts of general beneficence. The principal coal-field is between the river Deen, which flows through the town, and the hills stretching towards Donane, and forming nearly a square of six miles. The coals are very peculiar, having no bitumen: they are however highly sulphureous, and when burning in a close room have often occasioned death to the sleeping inmates. From the absence of smoke, and the many hours during which they remain unconsumed, emitting, like charcoal, a strong, clear, and steady heat, they are the best possible fuel for culinary purposes, and are carried a considerable distance into the adjoining counties as well as to the city of Kilkenny, which is about ten miles from the colliery. Of the coal-beds, which are at a medium depth of 100 feet (and of which superincumbent ferruginous argyl is an invariable index), the upper seam alone, which is about three feet in thickness, has been as yet worked; consequently there is no immediate danger of exhaustion.

As there is excellent potters' clay in this district, and the coal is peculiarly suited to the baking of pottery-ware, it is to be lamented that there is no enterprising capitalist disposed to establish a pottery manufacture, which was once undertaken, though without permanent success, arising chiefly from a deficiency of capital.

The peasantry of the neighbourhood of the coal-pits are among the most miserable of the human race; we have seen whole families in summer—and we fear that the same deficiency may be experienced there in winter too—without any covering except the fragment of a shirt or petticoat: the men expend much of their earnings on whisky, and leave their wives and little ones no other comfort save what they derive from huddling together on the wet mud floor of a miserable cabin, built of stones put together without lime-mortar, and pervious to wind, and inhaling the sulphureous coal-gases until their faces assume a very squalid and unhealthy hue. Pulmonary diseases are the result of the contaminated atmosphere, and strange to say, the most healthy portion of the neighbourhood is that employed in the cold wet mines, where the effluvia from ignited coals is not among their calamities. The want of timber all over this barony, except in the immediate vicinity of Castlecomer and Durrow, where the woods are very interesting and extensive, is observable; a more denuded or wretched tract of moor can hardly be imagined, or a more cheerless road traversed, than that which leads from the colliery to Leighlin Bridge, where several small tracts of turf-bog are visible on the verge of the county of Carlow. The coach-road, however, from Castlecomer to Kilkenny is excellent, and in some parts interesting.

There is a tract of hills which yield a good deal of pasture —much of it genuine fiorin grass—which, when relieved from moisture, affords a very palatable sustenance to cattle; where these elevations are subjected to a short course of tillage (potatoes succeeded by oats) they then become remarkably good pasturage. The poor town of Ballyragget (adjoining to which, however, is the handsome seat of the Kavanagh family, for many years the residence as well as the property of the late Mr Kavanagh of Borris) on the road from Kilkenny to Durrow, and on the banks of the river Nore, is within the limits of this barony, and has a population of more than sixteen hundred inhabitants. The town of Castledurrow, or Durrow, as it is generally called, is only partly in the county of Kilkenny, on its extreme northern point, and on the banks of the river Erkin. This village consists of good houses, built in the form of a square; and from the contiguity of Lord Ashbrook's well timbered demesne and castle, is an interesting place. The quantity of woodland in its vicinity is estimated at one thousand acres.

The adjoining barony of *Galmoy*, on the west side of the river, has in its northern parts much of the same characteristic features with those of Fassadineen, and like that contains a good deal of peat, which, however, does not exceed, in those two baronies, twelve hundred acres, but diversified with lineaments of a less coarse cast, and though the absence of limestone as a substratum—an advantage which the central portion possesses—causes comparative infertility, yet here also may be seen isolated portions of limestone. There are several of those raths in this barony, as well as in various other parts of the county, which have so much perplexed antiquarians. In sketching this portion of the county, we are reminded forcibly of our juvenile days, more than a quarter of a century ago; when we passed two or three successive summers in the *then* frequented village of Johnstown, for the sake of squiring young ladies and their mamas (the nurse for the sake of the child) to the medicinal spa of Ballyspellane, which is on the side of a high hill adjacent to the village. How we danced and even sung in those days! and how little did we trouble our heads about *Catholic Emancipation*, or any of the political points which have since rendered every nook of Ireland a complete hotbed of agitation.

The following was our usual diary:—In the morning we mounted a capering horse and rode to the spa, where we drank two tumblers of the water, which contains 97.3 of carbon and some portion of ferruginous matter, and is, from its combinations, a powerful tonic for debilitated stomachs, and which enabled us to digest three or four turkey eggs with a corresponding portion of bread and butter on our return to our little thatched lodging to breakfast. Almost all the houses of the village were, and we believe still are, thatched, and certainly are of a most uninviting character as to accommodation for fashionables. After breakfast we had sometimes a horse-race in a large field adjoining the demesne of Mr Hely, the proprietor; and on every other day, weather permitting, a drive or ride on our Bucephalus to Sir William Barker's beautiful demesne, Kilcooly Abbey, in the neighbouring county of Tipperary, or to some other but far inferior point of attraction. We dined of course, and wherever we could get a dinner, and in the evening philandered with a gay group of the "dear creatures;" went to a private tea-party or a public ball at the inn, and here we generally concluded our day with singing lustily "the Boys of Kilkenny." And fine boys they are—physically. By the way, every Kilkenny man has heard of

Captain H. who went into the —— regiment of the line from the Kilkenny regiment, and charged most gallantly—we believe at Waterloo—with his company at a critical moment when they were wavering under fearful odds. The magic words "hurrah for Kilkenny," uttered by this gallant young man, as he waved his hat and cheered on his men, made all those "Boys of Kilkenny," who had volunteered with him into the same regiment, rush nobly to the contest in support of their officer. So much did the magic influence of this single sentence avail in recalling to their minds the remembrance of that home to which they would feel an honest shame in returning as recreants. Finer men, indeed, can hardly be imagined, as to animal organization, than the lower orders of the Kilkenny population, but truth obliges us to add that, comparatively with the peasantry of Carlow, and the Queen's County, and still more with those of the county of Wexford, they are exceedingly unamiable; their ferocity of conduct, and doggedness of countenance, with their peculiar dress, blue frieze coats and corduroy breeches (which are generally open at the knee), with grey stockings, distinguish them at once from the Wexford peasantry, excepting that portion resident in the barony of Bantry, separated from the county of Kilkenny by the river Barrow, but not so readily, so far as countenance is concerned, from those of the other contiguous counties. The open violence and secret villany of many of those men is easily accounted for. The county of Tipperary bounds this county on the south, and there is a sufficiency of the leaven of diabolism there, to disturb not only the contiguous counties, but even those at the northern extremities of the island.

The immediate neighbourhood of this village of Johnstown has been long remarkable for the midnight attacks upon the mail-coaches, the robbery of arms from private houses, beating bailiffs, and other trifles of this nature. We remember the time when two mounted dragoons invariably attended the night-coach mail from Dublin to Cork through Johnstown and Urlingford, which is about a mile and a half distant; and we have in our mind's eye at this moment, the little plantation of Scotch firs by the roadside, and on the verge of a bog near the latter paltry town, where robbers were supposed to be frequently in ambuscade for travellers.

The question of a law for the relief of the destitute poor of Ireland being happily concluded, we may indulge in the hope, that some degree of elevation in their moral and physical condition will result; but it is interesting to look back to the time when the *apprehension* of being obliged to relieve their miseries, by a systematic tax upon their estates, first seriously affected the landlords of Ireland. Towards the close of the year 1817 there was a public meeting, in the city of Kilkenny, of several of the principal land-proprietors in this county and the adjoining ones, at which some excellent resolutions were passed regarding the means of providing labour for the unemployed poor, with the view of diminishing pauperism and mendicancy.

One of the resolutions was to the effect, that it was the duty and interest of the land proprietary to make such exertions as were most likely to provide employment for the numerous and needy population, and incumbent on the Legislature to establish such a system of taxation as would cause the property of each individual to bear a proportion of the general burden, and to contribute in just proportions to the wants of the poor.

Some influential persons, then as now, were decidedly of opinion that the assistance should be afforded indirectly, by means of employment, and not of direct gratuitous relief. One of the Waterford landholders present (and he was not alone in his opinion) objected to the resolution, as tending to convey an approbation of a tax for the poor, an income-tax, and an absentee-tax, to all of which he decidedly objected. Mr Morris Reade of Kilkenny, particularly, approved of the resolution in question, " for it contained a truth that could not be too widely diffused throughout the United Kingdom, nor too deeply impressed upon every class of its people. Could it be denied that the paupers were supported by the *resident* inhabitants? Could it be denied that the chief cause of the increase of pauperism was the want of employment; that the want of employment was caused by the want of capital; and the want of capital, in a great degree, caused by the large sums of money expended by the Irish absentees in other countries?"

The resolution passed without any formal dissent, after another very intelligent gentleman, of the manufacturing class, had gravely assured the gentlemen who were so apprehensive of having their pockets touched, that "the science of political economy had made sufficient progress, to convince the Legislature of the great error which had been committed in England by the imposition of such a rate."

We rejoice that the Legislature has not been convinced, as Mr Nolan seemed to suppose would be the case. The indiscriminate support by law of the idle or unemployed, would unquestionably operate as a bounty upon idleness, compelling the industrious to carry the lazy on their backs; but the support of the aged and destitute, rendering confinement in a workhouse the safe test of destitution, is not more than what humanity demands, and the state of the poor of Ireland calls for.

There is abundance of limestone about Urlingford, which ought to induce the improvement of the surrounding bog. Mr Neville, who lives very near the village, has an extremely neat and apparently well-formed demesne. Near this is a *square* rath, which is a peculiarity, the form being generally circular. Jonathan Oldbuck could have made out a story to account for this deviation from the usual shape; *we* cannot account for it. There are *several* cromlecks in this barony as well as raths, and a singular cell or hermitage at Clontubrid (built over a Druid's well), and the remains of a castle at Urlingford; and, indeed, the whole country is remarkable for the remains of castles and abbeys, round-towers and monasteries.

At Cloghmarta, the property of the St George family, there is a great deal of timber, abundance of limestone, and the state of agriculture is very good. There is here a flour-mill capable of manufacturing 12,000 barrels of wheat annually.

Cranagh.—This barony, which lies on the Tipperary side of the county, has little to distinguish it from the other hilly districts of this county. Its eastern boundary is within four miles of the city of Kilkenny. Many of its hills are of considerable height, sometimes enclosing fertile plains of meadows and pasture, and terminating to the south in a well planted and rich vein of land. On the east of the county about Freshford, where the St George family have considerable property and well-wooded demesnes (the Nore flowing in its devious course at no great distance), there is really some fine and highly interesting scenery. One of the best agriculturists in the county is a principal proprietor in this district, Mr Lawlor of Cranagh.

The soil of these hills, which are capable of cultivation even to the summits, is argillaceous clay and peat, as on the other hills described, and might easily be reclaimed, as they are not by any means boggy. Many parts of them were formerly planted, but now they present a very naked appearance, and have hardly the stump of a tree to mark where the woods once grew. The hills in the parish of Tulloroan give indications of coal, but the attempts at mining for it have been little more than superficial. The time will yet arrive, however, for exploring their subterraneous treasures.

The description of the agriculture of all these northern baronies may be comprised in a few words. The tillage crops, except in the improved plains about Freshford, and on the banks of the Nore at both sides, consists of oats and potatoes. Dairies are very numerous on the hills, and butter is produced in considerable quantities.

Pounded furze is the only kind of green food, except grass, known there for any kind of stock; and, wherever there is any shelter, the cattle are left out grazing during the winter. If housed by night, they are always turned out by day; and the same treatment applies to horses during their unemployed hours, when the extreme inclemency of the weather does not prevent their exposure. The want of fences of any kind on the hills, where they are so especially needed, precludes the pasturage of many sheep.

The cattle throughout this whole county are far inferior to those in some of the adjacent counties, especially *Carlow*. There are very few thorough-bred Durham or Ayrshire cattle, even among the gentry, though crosses of all kinds are plenty enough with them. The sheep generally are indifferent also; but the form and qualities of the pigs are greatly improved from the introduction of the Berkshire breed; and, as may be supposed, where there are many dairies, great numbers are fattened on butter-milk and potatoes. Several new lines of roads have been formed within a few years with considerable judgement. Those through the hilly districts have afforded increased facilities to the farmer for the conveyance of lime, which, when applied to the soil there, has wonderful efficacy.

Before we touch upon the barony of Gowran, which lies eastward of Cranagh, at the opposite sides of the Nore, the intervening city of Kilkenny, which is a county in itself, must be noticed.

Some antiquarians derive the name from Kyle–Ken–Ni—" the wooded head," or " hill near the river"—but of the justness or incorrectness of this etymology, we are incompetent to judge.

At the end of the twelfth century, part of the town now bearing the name Kilkenny (as contra-distinguished from the original Irish town on the opposite bank of the Nore) was commenced, and the castle, originally erected by Strongbow, was rebuilt, as we learn from Louis's Topographical Dictionary, and enlarged by William Le Mareschal the successor to his dominions.

> " A great council of the barons of the English pale was held here in 1294; and in 1309 a Parliament assembled at this place, in which severe laws were enacted against such of the English settlers as should adopt the Irish costumes; and anathemas against all who should infringe them were denounced in the cathedral by the Archbishop of Cashel, and other prelates who assisted on that occasion. In 1317, Lord Roger Mortimer, Justiciary of Ireland, and the English nobles, held a council here, to deliberate on the most effectual means of opposing the ravages of *Edward Bruce;* and an army of 30,000 men were assembled, and great numbers of families sought refuge in the town under the general alarm. * * *
>
> " In 1399, Richard II., on his progress through the south of Ireland, arrived from Waterford at this place, where he was entertained for fourteen days by the Earl of Ormonde. * * *
>
> " The last Parliament held in the town was in 1536, and was adjourned to Cashel; but this place still continued to be the occasional residence of the lords-lieutenants, and the chief seat of their government, for which purpose Henry VIII. granted to the corporation the site and precincts of the Blackfriars' monastery, on condition of their furnishing certain accommodation free of expense to the chief governor of Ireland, when in Kilkenny, from which they were subsequently released on payment of a fine of L.70.'

The castle, which has long been in possession of the noble family of Buller, has been rendered a truly magnificent baronial residence by the late lamented Marquess of Ormonde, who was a truly excellent man and an honour to his order. The manufacture of blankets used to employ from three thousand to four thousand persons, but now the number of hands does not exceed six hundred; although, considering the withdrawal of the protecting duties, which had so long given an artificial stimulus in Ireland, this branch of woollen manufacture is still very respectable in Kilkenny. There are several flour-mills, three distilleries (under the especial patronage of the Temperance Society), four breweries, two bacon-curing establishments, and some starch manufactories, within the precincts of the town, which, from the abundance of black marble in the quarries within a short distance of its walls, the clearness of its river, and the peculiar qualities of its coal, has been celebrated by its too partial admirers, as a city possessing water without mud, fire without smoke, and streets paved—not with twopenny loaves, as the story-book runs—but with marble.

The Kilkenny marble, which is black with white veins, sections of shells, and marine plants, is cut and polished for chimney-pieces and other purposes, in the mill near the city, and exported in considerable quantities. The great trade, however, consists in corn, especially wheat, which is the staple crop of a great proportion of the county, which possesses so much calcareous soil. But it is truly vexatious to see so much admirable land, so shamefully mismanaged; green food for cattle being never cultivated, except by a few of the gentry on a small scale. The want of manure is sensibly felt, and naked fallows, imperfectly prepared, are repeatedly subjected to the action of lime, when vegetable matter is required to renovate the exhausted earth. Though so much of the soil is admirably suited to turnip husbandry, the common farmers are ignorant of the use of green crops. One of the first central agricultural societies was formed in Kilkenny, and there are also local associations for agricultural purposes.

The barony of *Gowran*.—This is one of the most productive parts of the county, and if under British management, would present a splendid appearance. The whole soil is calcareous, and where there is not limestone-rock, calcareous gravel and limestone-pebble abound. The fields, considered with reference to Irish enclosures in general, are very large, and well adapted to sheep-feeding (were it not that the fences are execrable, being either mere banks of crumbling clay, without hedges or timber, or low stone walls, which are frequent in many parts of the county), and to wheat and oat crops, which, with the common run of farmers, are grown until the land becomes perfectly effete, without receiving any alternations of green crops,—a small portion of potatoes excepted,—or other rest or renovation than that which a naked fallowing affords, or repeated doses of lime, a manure that is totally unfit for it.

We sometimes think that many of the farmers in the central and southern portions of Kilkenny, where the constitution of the soil is so essentially calcareous, deal with it as an habitual drunkard does with his stomach; enfeebled by the constant stimulus of ardent spirits, he yet excites its overwrought action by increased and more frequent quantities of the stimulant, so perhaps the soil under consideration, "is *so used to the lime that it can't do without it.*"

We are familiar with the principal seats and farms in this locality especially, and shall hastily enumerate a few of them. Mount Loftus stands pre-eminent in elevation above the Barrow on the eastern side, and presents much diversity of rock and open fields of considerable extent. Granite forms the substratum of the soil on parts of this demesne, towards the higher grounds, and partially near the river, where large blocks give a picturesque appearance, as they peep through the trees on its margin.

The late Sir Nicholas Loftus was remarkable for the number and high blood of his horses, on whom he expended vast sums; he had seldom fewer than one hundred horses in his stables,—some of these *sires* of the highest value. He was unsuccessful on the turf, probably because he was a truly honourable man, and would certainly have made more money by any other kind of stock. When he hunted he had generally half a dozen or more mounted grooms in attendance, and made a very sporting appearance on *field* days among the members of the Kilkenny hunt. He had usually a good number of cows, but his grooms, stable boys, and stable cats, lapped up all the milk, without even allowing time for its *butyraceous* qualities to develop themselves; in plain words, he had often occasion, we believe, to purchase butter for his own toast.

There is an immense tract of open country; scarcely a hedge to be seen in the extensive parish of Powerstown, and on the hill sides skirting Brandon Mountain, and declining towards Graigue, where the bleakness is extreme. Adjoining Mount Loftus, is Barrowmount, on the river side, for many years the residence of the late Colonel Gore, an English gentleman, well acquainted with British husbandry, and an exemplar of all that was good in practice. The well arranged enclosures, and beautiful but now wildly growing hedge-rows, testify that the demesne was once under careful and systematic management; and even the small town of Gore's Bridge, in its present state of destitution, bears the traces of the former proximity of a fostering and employment-giving landlord. There is now no occupant of the house and offices. Near this, on the river side also, is Doninga, the seat of Mr Bookey, who has been always remarkable for the good quality of his sheep, and the neatness of his husbandry. Mr Handy's noble mills, and adjoining house, are seen a little farther up the river; and in the back ground, receding from the river about three miles, is the very handsome demesne of Shankhill, backed by a range of hills connected with the Castlecomer elevations, and sheltered by them from the west winds. These hills flank the mail-coach road to Kilkenny for a considerable distance, and contrast strongly with the well enclosed plain beneath. At Kellymount, on these heights, which are argillaceous, though the plain through which the road runs is entirely calcareous, are extensive flag quarries, and the working of these gives considerable employment, both at the quarries, and in the conveyance of the flags by the Barrow, up and down its course. The village of Gowran is in a fine wheat and and pasture country, and is now fortunate in having in its neighbourhood Lady Dover, the mother of Lord Clifden, a minor, and the sister of Lord Morpeth. The late Lord Clifden, the possessor of great estates in this county, was neither resident on them, nor remarkable for taking efficient interest in their improvement. In the opposite direction of this barony, and not far from the Nore, is Kilfane, the property of Sir John Power, the well known master of the foxhounds of this county, which is the Melton of Ireland. This gentleman, through the course of a long life, has sustained a very high character, and has probably a more extended acquaintance with the aristocracy of Ireland, than any other private individual. Some years ago, the club presented to him, in testimony of respect for his unbounded hospitalities, and general social worth, a very valuable piece of plate; and on the occasion of its presentation, the gentleman who was deputed to make a suitable speech, is said to have acquitted himself highly to the satisfaction of the company assembled on the occasion to a grand dinner. After a preliminary sentence or two, when he had just introduced Sir John (then Mr) Power's name, and was apparently about to deliver a well arranged set of eulogistic phrases, he abruptly concluded with—"What need I say any thing about him, for you all know him as well as I do." The pithiness of this, whether intentional or not, was exceedingly entertaining, and was infinitely more suited to the conviviality of a foxhunting club dinner, than the most eloquent and set speech, and produced a suitable effect. Some of the names of the Kilkenny gentry have been and will long be associated with the political and literary history of Ireland. The names of Flood and Charles Kendal Burke, the present Chief Justice, are familiar to every admirer of intellectual power and eloquence.

Genius in various ways has characterized the gentry of this county. Mr Richard Power, a brother of Sir John, and the late Mr Ruthe, were superior tragic actors, and through the magic of their talents, rendered celebrated the Kilkenny stage of amateur performers. Mr now Sir William Beecher, though not a Kilkenny man, always hunted with the Kilkenny hounds, and from whimsical and unaccountable associations, probably derived in consequence those histrionic talents which so long rendered him the admiration of the public.

But this has nothing to do with agriculture. The village of Innistiogue, where the remains of an Augustinian monastery add to the interest of the scenery, is exceedingly picturesque, superior in beauty, as to its locality, to every other part of this diversified county. It stands on the Nore, and close to Woodstock, the property of Mr Tighe, which is one of the most romantic seats in Ireland, and comprises within its limits 1500 statute acres, much of which is covered with every variety of the finest timber, even to the water's edge. The father of the present possessor was the author of the statistical survey of the county, and of other literary productions, and the brother-in-law of the celebrated authoress of the poem of Psyche. The remains of this accomplished lady are entombed in a mausoleum within the church-yard of the village. The present owner, and Lady Louisa Tighe his wife, are active in promoting every thing useful on the estate; schools, houses of industry, and modes of communicating agricultural knowledge, are among their especial objects. Innistiogue is now the highest point of navigation on the Nore, accumulations of mud having blocked up the river at Thomastown (an incorporated town, but of inconsiderable size), where flat-bottomed boats used formerly to ply in considerable numbers. The sum of L.12,000 has been estimated as sufficient to open the channel for boats of 70 tons burden, but the excellence of the roads enables the carrier, with his Scotch dray, to convey goods and agricultural produce to and from this town, and, indeed, carts are so much more expeditious than boats for the purposes of traffic, that they are preferred between this neighbourhood and the two opposite points of Waterford and Kilkenny. There is a valuable calcareous sand, called Kilmacow sand, brought up the Nore to Innistiogue, and carried up the surrounding hills for many miles, but the superior value of lime is now appreciated, and will soon supersede the use of the other manure, which, to be efficacious, should be used in large quantities. Farmers are now learning to estimate the real expense of time and labour, and consequently to apply horse power more judiciously. Kilmurry, the frequent residence of Chief Justice Barker, and Kilfane, already referred to, are near Thomastown.

The town of Graig, or Graigue, which is on the river Barrow, and on the high road from Carlow to New Ross, and near

St Mullins, where the canal portion of the river ceases, is beautifully situated, having the mountains of Blackstains in front. It might be rendered, under happier circumstances, a thriving town, but it is now the receptacle of hundreds of paupers, and without any person of respectability in it, or in the immediate vicinity, to afford employment, or promote its interests in any manner, except the agent of Lord Clifden, who has built a house on the outskirts of the town, in a very picturesque situation. The late noble owner, fortunately for the beauties of the neighbourhood, allowed a considerable portion of mountain land overhanging the river and on the road towards Ross, to be planted, and this, with the trees which Mr Burchill the agent planted about his own house, are now producing a very pleasing effect.

On the entrance to the only street deserving the name, are the beautiful remains of a Cistercian monastery, of which the eastern window is in perfect preservation. The agriculture here is principally limited to potatoes, oats, and pasturage. Cattle are grazed on the sloping and ill-drained hills, which being argillite, might be rendered exceedingly productive, by the application of lime. Butter, pigs, and children, are here plenty enough.

Following the course of the river on the left for two or three miles, diverging a little from its direction to the eastward, the traveller, if proceeding to Ross, passes over a very hilly road, close by some improvements made on the most forbidding portion of that tract by Mr Foote, who, at the age of seventy years, was assassinated by some skulking murderers in the noon-day, when walking on his own land. This gentleman had fenced, drained, and planted, and would have converted into profitable ground, a remarkably bleak and neglected extent of tillage and grazing land. The trees and thorn hedges on the way side, remain as records of what the proprietor has done, and as indications of what he would probably have effected, if the Rockites had allowed him to live a little longer. We understand that the property is for sale; probably from the disgust which his family entertain toward the neighbourhood where the atrocious act was planned and executed.

On reaching the church and chapel of Roar, or Rower—

let etymologists decide which—that stands on the summit of the hill towards Ross, and which is in a pre-eminently uninviting position, we enter the barony of *Ida*, and drive on towards the Barrow, from which the road diverges, and have a view of some rich meadow lands and woods towards the river. Within the parish of Roar is Ringwood, a residence of Lord Clifden, and a richly wooded and romantic spot called Ballynabarna, the property of Mr Bolger. All this tract is superior for meadow and pasturage, as well as for potatoes and oats on the higher lands. A very long wooden bridge conducts over the Barrow to the Wexford side, and another handsome bridge of the same material unites the Wexford side again with the village of Rossbercon (which is in fact an extension of the town of Ross), with the county of Kilkenny. At this point the beauty and richness of the scenery are considerable. There is nothing at all pleasing to the eye on the hilly road from Rossbercon to Waterford, which is twelve miles distant, and where the soil is light, except by the river side, which is a continuation of meadow land, with some fine tillage farms on the undulating lands immediately above, and which have been at different times held by very intelligent and practised farmers. Mr Murphy, a large proprietor of the neighbourhood, set a very spirited example of improved agriculture at his beautiful residence Annace, about a mile from the village of Rossbercon, and was succeeded by the Messrs Keogh, tenants of Annace for some years, under a decree of the Courts. These gentlemen kept up a valuable stock, and were among the first persons there who cultivated mangel wurzel; their farming was indeed excellent.

The soil throughout this barony is generally light, with an argillaceous schistus underneath; indeed, all the hills, here and in the other parts of the country, when elevated above the calcareous districts, are inclined to a moory surface, and when neglected, produce little but heath. Granite, which forms so much of the base of the hills in the county of Carlow, is not a substratum in this county, except in the secondary hills in the southern portion of the county. After a drive over a hilly cold road—a new line, however, partly by the river side, is in progress—and a cheerless view of naked hills, suited only to sheep, the well wooded seats immediately adjoining Waterford, cause the traveller to open his eyes. Sir John Newport has a residence here, separated from Waterford by the river Suir, which is the western boundary of the county, and across which is thrown a magnificent wooden bridge, 832 feet in length, and 40 in breadth, erected under the superintendence of the famous American engineer Mr Cox of Boston.

Toerk is the contiguous barony on the south-west side, and this has for its western termination the river Suir, along the banks of which are some of the richest and deepest portions of soil in the county. Vessels of 100 tons burden can now navigate this river to Carrick, which is on the Tipperary side, and, when some obstructions shall have been removed, larger vessels can navigate between this place and Waterford, to the obvious advantage of both sides of the river, which export agricultural produce to a very great extent. Pilltown, which derives its name from the pile or branch of a river, is beyond all comparison the most interesting little town in the province; it consists of one very wide street, containing about one hundred houses, each of which has its little garden of flowers and evergreens in front. Great praise is due to the Earl of Besborough, or more properly to his Lordship's son, Lord Duncannon, for the extreme degree of neatness and comfort observable here, so strikingly contrasting with the slovenliness and air of poverty apparent elsewhere. Pilltown is really a perfect model of village beauty. The allotment system, but with much larger quantities of land than are usually given to labourers and mechanics in England, is in practical operation here; almshouses are to be erected, in consequence of a bequest of L.1000, so that the economy of the village will be complete. There is a handsome market-house built by Lord Besborough, and a neat hotel, the proprietor of which has a museum of paintings and Irish antiquities. The river is navigable for boats of 200 tons burden to the mouth of the pile, which is a mile and a half from the town, and for vessels of lighter draft to the quay of Pilltown. A Scotch mechanic of the name of Fairly, has established a factory for ploughs, and other farming implements, of the most improved description, which he makes in a very superior style. There is no waste land in this neighbourhood, as may be well imagined, from its surprising fertility, and, besides limestone quarries in abundance, there is near the village a quarry of variegated grey marble, susceptible of a high polish. The park of Besborough contains 500 acres, and is well managed in every particular. In the hall of the noble mansion are four columns of Kilkenny marble, each of a single stone, ten feet high. Belline is another fine demesne, belonging to Mr Currey, which, with others of much richness and beauty, combine to render this a very superior portion of the county. Sea-sand and sea-weed are brought up from the river frequently for manure, but lime is principally used, and has superseded the use of that valuable manure limestone gravel, which, before the burning of lime, was excavated and applied to the land for an incalculably long period. Composts of lime and earth are very common here, and throughout the county, and the scrapings of roads, combined with straw and ferns, laid on the lanes and bye roads, are industriously accumulated. This district is, indeed, famous for swine of an enormous size, and of truly brutal appetites. Some of the sows have been often known to devour their young.

The next barony on the northern side is *Knocktopher*, which, on the eastern side, adjoining Ida, is very mountainous, and there are here, as in other divisions of the county, all the gradations from argillaceous clay to light gravel, though the former is the predominant soil of the county. In the neighbourhood of the town of Knocktopher, where limestone abounds, the wheat crops, as may be expected, are highly productive, and would be considerably more so, if the land had more indulgence, and seed was not so prodigally sown. The Rev. Sir Richard Languishe, Bart., is the principal resident proprietor here. There are some splendid seats in this barony, within the parish of Terpoint, among which Mount Juliet, belonging to the Earl of Carrick, and containing 900 acres, is conspicuous, both from its elevation and extreme beauty of timber and water, the Nore being in its vicinity. Mr Bayly's seat, Norelands, is near this; and on the same river, Terpoint House, the property of Mr Hunt; Flood Hall, the residence of Mr Flood, which stretches into the barony of Kells, forms, with Belmore Lodge, an unrivalled combination of beautiful seats. There is a good deal of tillage in this neighbourhood, but a large proportion of meadow and feeding land. The number of wealthy and fashionable families here, is such as to render necessary very considerable supplies of hay, for horses kept for pleasure; and of beef and mutton for their hospitable boards. The proportion of green crops is very inconsiderable. Limestone quarries are numerous. This division having no peculiarities, we pass on, to avoid repetition, through *Kells*, which is a very small but highly productive barony, with little or no mountain, and suited every where to the highest state of improved culture. Chapel Tyod, the residence of Major Tyod, is the principal seat; and the farming on this gentleman's property is very good. Wheat is the staple crop, and of this, under favouring circumstances, a large average is obtained. The almost universal mode of sowing it, whether on fallows or after the potato crop, is *under plough*, in ridges of six furrows. When sown and ploughed it is left unharrowed, and the crumbling of the rough clods in the ensuing spring after the winter's frost gives a kind of moulding which invigorates the plants. From experience we have no doubt that when the seed is sown in this way, wetness is guarded against effectually by the high convex form of the ridges and the water furrows, and that it is better not to harrow down the ground until spring, as the clay is otherwise very apt *to run together* if so treated before the winter rains. But the ordinary farmers are afraid to apply the harrow to the plants in spring, lest they should tear them out. It is hardly necessary to say that this is an imaginary danger if the harrow pins or tines be short, and that even if one-half of the plants were ejected by this or any other process, the crop would be essentially served, as it is invariably one-half too thick.

The incorporated town of Callan is principally, but not altogether in this barony, some portion of it is in Shillelogher. This is one of the numerous estates of Lord Clifden, and is in a fine country on the King's River, and on the high road from Dublin to Cork, by Clonmel. With reference to size it is considered next to Kilkenny. The population are unemployed and poor. Every part of the surrounding land is suited to tillage; and nearly 600 acres were enclosed by an act of Parliament in 1831.

Shillelogher completes our list of baronies. This bounds the town of Kilkenny on the south. Bennet's Bridge and Ennisnag are small villages within its boundaries, of which the latter is remarkable from its proximity to an extensive cloth manufactory established by the Messrs Nolan, who introduced large flocks of merino sheep into the county, and for a long time manufactured their wool. Nothing could exceed the state of moral discipline and perfect happiness apparently preserved among the work people. No pains were spared to provide education for the young, and innocent amusements, among which music was a principal object of attention; but we believe that the efforts of the British manufacturers to strangle such an establishment in Ireland, even though they were losers for a time in the competition, were such as could not be withstood, though local and Government aid at one time was freely afforded to keep in active operation an establishment which conferred such remarkable benefits on the surrounding district. The expenditure at first was L.30,000, and L.10,000 more was added for buildings, but in the course of a very few years after the commencement of the manufacture, the projectors were obliged to dismiss 800 pair of hands, and eventually to let the works to a Dublin and Leeds company, which, after three or four years of experiment, abandoned the undertaking likewise. Not very far from this is Barnchurch, a very extensive union, held by the Rev. Dr Butler, who has been an eminent agriculturist, and contributed much by example to improve the defective habits of the farmers around him. Unhappily for the character of that part of the country his tithe proctor was barbarously murdered before his face and in his own lawn by an immense crowd of anti-tithe parishioners. This gentleman, who had been a benefactor in various ways to his neighbourhood and the physician of the poor, was forced to leave his residence for some years, and thus inflicted a very serious punishment on the ferocious peasantry in his neighbourhood. Bennett's Bridge is a neat village near this, and all around it tillage is indefatigably pursued, except on the flat meadow lands near the Nore. The parish of Danesport, in which Major Wemyss resides, is a very fertile portion of the barony, and tolerably well tilled. It would be mere repetition to add any more concerning the localities of the county, which vary in no essential particulars from what have been sketched; so we shall conclude with a brief extract from Lewis's Topographical Dictionary, a work which has much more merit than has been ascribed to it as yet.

"The linen trade was introduced towards the close of the seventeenth century, and prospered for fifty or sixty years, but within the last century it has so decayed as to leave few traces of its former prosperity, only the coarsest cloths for domestic consumption being now made. Many of the bleach-greens were converted into mills of various kinds, but there are three still tolerably well employed. In the hilly districts every farmer grows a little flax for his own use, and generally bleaches his own linen; he also often has a little hemp to make sacking. The number of flour-mills is very great; there are twenty-two on the Nore between Durrow and Innistiogue; on the King's River from Callan to the Nore, ten; on the part of the Barrow within the county, three or four; and several on the streams which fall into the Suir and other great rivers. Rape mills have been erected, but are not profitable; the exportation of the seed being found more advantageous than the manufacture of the oil. The principal part of the grain raised is sent to Dublin, in the shape of flour, malt, and meal, the preparation of which is another source of internal wealth; the wheat and barley find a ready sale among the numerous millers, maltsters, and distillers, so that very little is brought to the market-house.

"The rivers were formerly famous for their salmon, much of which was sent to Dublin, both fresh and preserved in ice; but the quantity has decreased during the last century, caused, as is supposed, by the increased number of mills. The salmon trout is not uncommon in the rivers; its usual length is from eighteen to twenty inches. The shad comes up the Nore in April and returns in May; the sturgeon appears but rarely; porpoises sometimes follow the salmon beyond Waterford; the conger eel is sometimes taken; lampreys are thrown away by the fishermen, not being even kept for bait. All the aquatic birds usually found along the course of large rivers are met with here. The common gull follows its course to a great distance, devouring many insects pernicious to the farmer, and returns to the sea at night. The common people call it the white crow. The kingfisher and water-ousel are not uncommon."

ON THE DISEASES INCIDENTAL TO THE MOST USUALLY CULTIVATED PLANTS.—NO. VII.

By GEORGE W. JOHNSON, Esq. Corresponding Member of the Maryland Horticultural Society.

Extravasated Sap.—Under this general name I purpose to include the consideration of gumming, bleeding, and other injurious affections under which plants occasionally labour, on account of their sap escaping from the properly containing vessels. The extravasation proceeds from the alburnum, or inner bark, and may arise from four causes.

1. The acrid, or alkaline state of the sap, which has been considered already, when treating of the canker. 2. From plethora, or excessive abundance of the sap effused. 3. From the unnatural contraction of the circulatory vessels. 4. From wounds. 5. Heat and dryness.

1. In regard to the alkaline state of the sap, it may be observed, additionally, that the excessive alkaline quality of the sap, imparting to it the power of destroying the fibre of its containing vessels, is placed on the basis of chemical experiment. A weak alkaline solution dissolves woody fibre, without alteration; and it may be thrown down again by means of an acid. By this property we are enabled to separate wood from most of the other vegetable principles, as few of them are soluble in weak alkaline leys.* It is true, that the vital principle may counteract powerfully this chemical action; but it will not control the corrosive effect of an active agent in excess, if repeated for any length of time. The blood of the human system contains, when in a healthy state, a portion of common salt; yet if this saline constituent is in excess, it induces inflammation and organic derangement.

2. *Plethora* is that state of a plant's excessive vigour, in which the sap is formed more rapidly than the circulatory vessels can convey it away. When this occurs, rupture must take place, for the force with which it is propelled during circulation, and consequently the force acting to burst the vessels during any check, is very much greater than could have

---

* Thomson's System of Chemistry, vol. iv. p. 180, Ed. 6th.

been expected, before Mr Hales demonstrated it by experiment. This distinguished vegetable physiologist found, that in the vine this force was able to raise 19 lb. weight. To the stem of a vine cut off about two feet and a half from the ground, he fixed a mercurial gauge, and luted it to the sides of the stem with mastic. The gauge was in the form of a syphon, so contrived, that the mercury might be made to rise in proportion to the pressure of the ascending sap. In this instance it raised the mercury to a height of thirty-eight inches.* The branch of an apple-tree was separated from the parent trunk, and placed in water. When the leaves were upon it, the force with which it propelled its sap, raised the mercury four inches, in a tube attached as to the vine; but a similar branch, deprived of its leaves, scarcely raised the mercury a quarter of an inch. The pear, quince, cherry, walnut, peach, gooseberry, and sycamore, had a power equal to elevating the mercury, varying from three to six inches. The elm, oak, chesnut, hazel, sallow, and ash, elevated it variously from one to two inches. The laurustinus, laurel, and other evergreens, scarcely raised the mercury at all.*

The experiments made with a separated branch do not give the full amount of the parent tree's power, because the exhaustion incident to amputation necessarily diminishes the vigour, and every minute the power in the branch is less, because it is so much the nearer to death.

Now, we know, that a much less pressure than any of those above mentioned, would be capable of bursting the delicate membranes of any of their exterior descending sap vessels; and it is in such outer ducts that the injury first occurs. When one exterior vessel is ruptured, that next beneath it, having the supporting pressure removed, is enabled to follow the same course, at the same locality, and in proportion to the length of the time the sap continues in excess, is the depth to which the mischief extends, and the quantity of sap extravasated.

If the extravasation proceeds from this cause, there is but one course of treatment to be pursued. Sever one of the main roots, to afford the tree immediate relief, and reduce the staple of the soil, by removing some of it, and admixing less fertile earthy components, as sand or chalk. This must be done gradually, for the fibrous roots that are suited for the collection of food, from a fertile soil, are not adapted for the introsusception of that from a less abundant pasturage.

---

* Hale's Veget. Statics, vol. i. p. 107.

† Ibid. p. 114, &c.

Care must be taken not to apply the above remedies, before it is clearly ascertained that the cause is not an unnatural contraction of the sap-vessels, because, in such case, the treatment might be injurious rather than beneficial. I have always found it arising from an excessive production of sap, if the tree, when afflicted by extravasation, produces, at the same time, super-luxurious shoots.

3. Local contraction of the sap-vessels. If the extravasation arises from this cause, there is usually a swelling of the bark immediately above the place of discharge.

I have a cherry-tree in my garden, in Essex, of which the stock has grown very much less freely than the graft. Consequently, just above the place of union, a swelling, resembling a wen, extends round the whole girth of the tree, from which swelling gum is continually exuding. In the stem below it, I never observed a single extravasation. In a case such as this, the cultivator's only resource is to reduce cautiously the amount of branches, if the bleeding threatens to be injuriously extensive, otherwise it is of but little consequence, acting like temporary discharges of blood from the human frame, as a relief to the system.

4. The extravasation of sap from a wound, is usually the most abundant, and therefore the most exhausting; and, as the wound, whether contused or cut, is liable to be a lodgement for water, and other foreign bodies, opposed to the healing of the injured part, the discharge is often protracted. This is especially the case, if the wound is made in the spring, before the leaves are developed, as in performing the winter pruning of the vine later than is proper. In such case the vine is always weakened, and in some instances it has been destroyed. The quantity of sap which may be made to flow from some trees is astonishing, especially in tropical climates. Thus from a cocoa-nut palm, from three to five pints will flow during every day for four or five successive weeks.

The best modes of checking such exudations, is by placing a piece of sponge dipped in a solution of sulphate of iron, upon the discharging place, covering the sponge with a piece of sheet lead, and binding it on firmly. The sulphate acts as a styptic, promoting the contraction of the mouths of the vessels; the sponge encourages cicatrization, and the lead excludes moisture.

5. Heat attended by dryness of the soil, as during the drought of summer, is very liable to produce an unnatural exudation. This is especially noticeable upon the leaves of some plants, and is popularly known as *honey-dew*. It is somewhat analogous to that outburst of blood which, in such seasons, is apt to occur to man, and arises from the increased action of the secretory and circulatory systems to which it affords relief. There is this great and essential difference, that in the case of the plants the extravasation is upon the surface of the leaves, and consequently in proportion to the abundance of the extruded sap, is their respiration and digestion impaired.

The honey-dew was noticed by the ancients, and is mentioned by Pliny (Hist. Natur. xi. 12) by the fanciful designations of the "sweats of the heavens," and "the saliva of the stars," though he questioned whether it is not a deposition from the air, purging this from some contracted impurity. More modern philosophers have been quite as erroneous and discordant in their opinions relative to its nature. Some with the most unmitigatable asperity declare that it is the excrement of aphides; others as exclusively maintain that it is an atmospheric deposite; and a third party consider that it arises from bleeding consequent to the wounds of insects. That there may be a glutinous, saccharine liquid found upon the leaves of plants arising from the first and third named causes is probable, or rather certain; but this by no means is conclusive that there is not a similar liquid extravasated upon the surface of the leaves, owing to some unhealthy action of their vessels. It is with this description of honey-dew that we are here concerned. The error into which writers on this subject appear to have fallen, consists in their having endeavoured to assign the origin of every kind of honey-dew to the same cause thus:—The Rev. Gilbert White seems (Naturalist's Calendar, 144) to have had a fanciful and comprehensive mode of accounting for the origin of honey-dew; he tells us, "June 4, 1783. Vast honey-dews this week. The reason of this seems to be, that in hot days the effluvia of flowers are drawn up by a brisk evaporation, and then in the night fall down with the dews with which they are entangled."

The objection urged to this theory by Curtis (Trans. Linn. Soc. vi. 82), is conclusive. "If it fell from the atmosphere it would cover every thing on which it fell indiscriminately, whereas we never find it but on certain living plants and trees. We find it also on plants in stoves, and green-houses covered with glass."

Curtis had convinced himself that the honey-dew was merely the excrement of the aphides; and he supported his theory with his usual ability, although he justly deemed it a little "wonderfully extraordinary," that any insect should secrete, as excrementitious matter, *sugar*—he even thought it possible if the ants, wasps, and flies, could be prevented from devouring the honey-dew "almost as fast as it was deposited," to collect it in considerable quantities and convert it into the "choicest sugar, and sugar-candy." The bees, however, he found totally disregarded the honey-dew which came under his observation, a conclusion in which I do not agree, and which is also opposed to those of the Abbe Boissier de Sauvages, who, in a memoir read before the Society of Sciences at Montpelier, gives an account of "a shower of honey-dew," which he witnessed under a lime tree in the king's garden at Paris.*

The various successful applications of liquids to plants, in order to prevent the occurrence of the honey-dew, and similar diseases, would seem to indicate that a morbid state of the sap is the chief cause of the honey-dew, for otherwise it would be difficult to explain the reason why the use of a solution of common salt in water, applied to the *soil* in which a plant is growing, can prevent the appearance of a disease caused by insects. But if we admit that the irregular action of the sap is the cause of the disorder, then we can understand that a portion of salt introduced into the juices of the plant would naturally have a tendency to correct or vary any morbid tendency, either correcting the too rapid secretion of sap, stimulating it in promoting its regular formation, or preserving its fluidity. And that, by such a treatment, the honey-dew may be entirely prevented, I have often myself witnessed in my own garden, when experimentalizing with totally different objects. Thus I have seen plants of various kinds which have been treated with a weak solution of common salt and water totally escape the honey-dew, where trees of the same kind, growing in the same plot of ground, not so treated, have been materially injured by its ravages. I think, however, that the solution which has been sometimes employed for this purpose is much too strong for watering plants. I have always preferred a weaker liquid, and am of opinion that one ounce of salt (chloride of sodium) to a gallon of water is quite powerful enough for the intended purpose. I am in doubt as to the correctness of Knight's opinion as to the mere water having any material influence in the composition of such a remedy, since I have noticed that standard fruit-trees, around which, at a distance of six or eight feet from the stem, I had deposited, at a depth of twelve inches, a quantity of salt to promote the general health and fruitfulness of the tree, according to the manner formerly adopted to some extent in the cyder counties for the apple orchards; that these escaped the honey-dew (which infected adjacent trees) just as well as those which had been watered with salt and water. It is with much diffidence that I doubt the correctness of any of the opinions of such a man as the late lamented President of the Horticultural Society, for to him vegetable physiology is very deeply indebted for many highly scientific, accurate, and interesting researches; he seemed, too, on all occasions, to introduce into his experiments an elegance of research and ingenious management, worthy of the great class of organized substances to which he devoted his valuable life. Will not something be done towards shewing the gratitude of his contemporaries? some nook be found at Westminster for his tablet?

---

* A writer, in a late number of the *Gardeners' Gazette*, when relating some remarkable anomalies observed in the habits of the honey-bee this season, remarks, in regard to honey-dew, "The honey gathering has indeed been very bad this year; in most parts of the country the average quantity of honey taken from each hive never exceeding one pound; but at one of my apiaries, where there are large woods of oak, and commons of heath and wild thyme, there was a honey-dew every morning for thirteen days in August, and when none of my stocks weighed in October less than 26 lb.; and one of this year's swarms, 32 lb."—Editor.

Hitt, who was a practical gardener, and published his work upon Fruit-trees in 1755, after describing the honey-dew, and his ideas of its effect upon fruit-trees, says, "If the season be wet, spread common salt over the border, about eight ounces to each tree, for the more salt the juices contain, which form the young plants, the more smooth and compact their leaves will be, and thereby less subject to the penetration of the honey-dews than when they are composed of juices more watery."

Mr Knight's experiments were made with the view of preventing the blue mildew, with which pease and some other crops are usually annoyed, especially the early and late sown; and by keeping the rows well watered, he perfectly succeeded, employing sometimes water alone, and on other occasions water, in which "a small portion of common salt" was dissolved. By this process "I have constantly succeeded," 'he remarks, "in preserving the health of my autumnal crops of pease;"* and although the applications were made to provide against the injuries of another disease, yet still certainly in some degree support the conclusions drawn by Hitt and myself as to the preventive power possessed by a weak saline solution. It is more than probable that most of the diseases of plants, arise in some way or other from the irregular action of the sap, caused very often by sudden transitions in the temperature of the atmosphere. By a very easy experiment the cultivator may convince himself of the power of common salt in preventing these injuries—he need only strew it at the rate of about sixteen bushels per acre over *a portion* of a bed of cabbages or broccoli, &c., and when the frost sets in he will soon perceive how much more stoutly the salted plants withstand the effects of the frost, than those which have not been thus assisted. This result is produced very likely by the salt after being absorbed by the juices of the plant, enabling the sap to withstand more effectually the congealing power of a low temperature, since the more salt watery fluids contain, the lower is the temperature required to render them solid. There are, also, most probably other ways in which the salt thus operates on vegetation, and with which we are but imperfectly acquainted.

---

* Banks on Blight, p. 32.

FARMERS' LUXURIES.

It has frequently been matter of surprise to us, that small farmers, from generation to generation, pass through life at the same dull pace, going over the same rugged ground, plodding the same apathetic routine, unambitious to vary and increase their innocent recreations, when every facility is within their power to vie with their wealthier brethren in the possession of so styled Luxuries. We approve that excellent aphorism, "To enjoy is to obey." Our beneficent Creator has placed innumerable sources of gratification within the reach of all his creatures. His intention evidently is, that the productions of various climes should be consumed by nations "far asunder as the poles;" that Scotland should quaff the vintage of the sunny south, that shoals of her herrings should find their way in savoury heaps to the inland dwellers of wide continents, or He would never have put it into the hearts of men to construct great ships, and to steer their course over the trackless ocean by the guidance of His heavenly sun and moon and stars. If, as Lord Bacon says, "Admiration is the superlative of praise," it follows that the more we enlarge our sphere of innocent and rational enjoyment, the greater the number and variety of proofs of His creative power and wisdom we collect around us, the more must our admiration be excited, and the higher ought to be our feeling of gratitude, veneration, and praise. "Use, but do not abuse the good gifts of God," appears to us to be a text worthy of the Creator and his creatures, one that is, alas! in this restrictive age cruelly neglected. But to our subject of "Farmers' Luxuries."

Who ever heard of small farmers indulging in those horticultural dainties and delicacies that require the aid of frames and hotbeds to perfect their growth? Yet who would point out a legitimate objection to an enjoyment so entirely innocuous? Why should cucumbers (in frames of course, we mean), grapes, peaches, melons, and even pine-apples, be reserved for the gratification of patrician palates, any more than that the bloom of delicate tinted flowers should be kept sacred for the solace of the eyesight of the wealthy; or that their grateful odour should refresh exclusively the olfactory nerves of the aristocracy? Employment is the bliss of life: there is not a more unhappy being than the man or woman who is not obliged to exert those mental and bodily functions which have been beneficently bestowed upon us, to be used for the preservation of our health; nor can there exist a more sickly, silly, pretty sounding, pernicious, little southern phrase than "*Dolce far niente.*" "*Amaro far niente*" would be nearer the truth. Luxuries that may be attained, without unjustifiably employing time and capital, are not only perfectly admissible at the tables of those who can afford them, but the man is to be applauded who seeks to secure them. The extra delicacies which we obtain by our manual dexterity and industry we are fully entitled to enjoy.

A man, however his time may appear to be entirely occupied by his business (we speak not, it is obvious, of our unhappy brethren in squalid lanes and dismal manufactories), say that of a farmer, for example, has always many hours in a week entirely unemployed, which are lolled, or dozed, or smoked, or drunk away, unless he have a love of literature strong upon him. A very few of these wasted hours might be turned to great advantage by devoting them to the cultivation of *luxuries;* and not only luxuries for self gratification, but for the sale of them, whereby many little enjoyments of other kinds might be easily attainable.

Farmers who cultivate their own land possess advantages for the accomplishment of the plan we advocate beyond those who rent their farms, particularly they who are bound by the terms of their leases from using the manure for any other purpose than the benefit of the land under tillage. In some parts of the southern portion of our island, we have been informed that the occupant is restricted from the privilege of manuring his garden with any portion of it. This is as arbitrary as it is absurd, since it is an admitted fact that manure is in a better condition for farming crops *after it has undergone* *that first stage of fermentation, which is precisely the state in which it would effect the desired end in obtaining "farmers' luxuries."* An outlay of a very few pounds in the first instance, would ensure a valuable return, without any increase or renewal of expense for many years. Melon-pits, peach-pits, &c. have a fearful sound; a poor man would as soon think of a service of plate for his table as of such costly and exclusively patrician erections in his garden; but we hope to prove to our farming friends, especially such of them as are industrious themselves, and have one or more sons at home to assist in the labours of the farm, that the erection of a melon-frame, peach-pit, &c. with their cost and management, is to be as easily and cheaply obtained as any other portion of his stock.

If a man have a mechanical turn, as it is styled (and how desirable, how valuable, is a talent for carpentering and bricklaying in all situations where the income requires strict attention to meet the demands of a family!) many, many pounds may be annually saved by exerting that talent. We have seen this exemplified in an industrious family, in which the results have been most satisfactory. *Practical* plans are those which we advocate and advise; with vague schemes we would not puzzle ourselves or our readers. The stagnant state of our agricultural brethren is beginning to interest the lords of the soil, and associations are forming to better their condition, by teaching them many elementary principles of subjects on which they are profoundly ignorant. May these institutions prosper! In the mean time, let us, in our humble way, urge upon every farming man these simple truths,—that active employment is a privilege, a boon bestowed upon the working classes as a compensation for the want of that wealth which the poor erroneously covet through ignorance of its attendant miseries; that industry brings contentment, that blissful feeling which wealth can never bestow; that the fiat which has been called "the curse of the ground," namely, "Thou shalt earn thy bread by the sweat of thy brow," is one of the kindest and wisest of the Creator's commands; that he who best knows how to exert the mental and bodily powers which have been given him for his benefit, is a wise and enviable man; that "knowledge is power," and not only power, but happiness.

Hence no one should sit down in the supine consciousness of being a farmer, and merely a farmer, to plough, and sow, and reap, and jog to market, and count his gains, and take his pipe and glass, and so to bed the whole year round, and "seek to know no more." As we have said already, there are many hours, nay, whole days, when the routine of a farm moves sluggishly, nay, when it must stand still; these are the opportunities that have been beneficently ordained, and which a mind of energy will gladly employ, in order to better his own condition, and, by the influence of example, that of his children and dependants.

Idleness is mischief, it is seldom mere inaction; and no stronger proof of the truth of this axiom need be adduced than the evident improvement in the morals of our artizans in the thickly populated towns, since the introduction of Mechanics' Institutions. Those hours which they formerly passed in *idleness*, in beer and gin shops, fostering a spirit of fierce discontent and disaffection, are now devoted to peaceful acquisition of science, to attain wisdom as well as knowledge, to elevate their minds and to improve their condition.

Parents are little aware of the immense benefit, in every possible way, that results from encouraging industrious habits in their children. Very young lads may be made of essential use in a homestead, and at the same time their employments would be to themselves delightful amusements. A boy who evinces the slightest turn for mechanics, should always be indulged in his partiality, and be encouraged to try his skill. A chest of rough and simple tools might be given as a reward, and opportunities afforded, should his father be unable to instruct him, for the acquirement of the right handling of his hammer and plane. Once set afloat, his own enthusiasm will carry him forward, and his parents will reap the double recompense of adding to their slender income by his pleasant exertions, and of seeing the effects of industrious habits upon his mental and bodily health, which, but for their judicious fosterage, might have been laid waste by idleness with all its train of evils.

We speak advisedly—we *know the practicability of all we advocate*,—we have seen the results of this admirable home education, and have rejoiced with the parents, while we participated with the children, in their delight at their achievements. When we say that we have witnessed the erection of peach-pits, hot-houses, and other buildings, which would *do* no discredit to any builder; and that the whole of the work, bricklaying, carpentering, painting, glazing, flues, &c. was the entire amateur performance of a father and his sons, youths of twelve, fourteen, and sixteen years of age, we shall not be accused of theorizing in recommending other parents to follow so judicious a plan. The experience that we have obtained, we will readily impart; and by placing a fair statement of method and cost before our readers, enable them to work without further outlay than is required for the mere materials. We will begin with a simple cucumber and melon frame; for, though these are to be found on the premises of every gentleman, and therefore are familiar objects to all persons in the middle ranks; they are seldom of domestic construction, and small farmers would be fearful to encounter the certain expense of a carpenter's bill for an uncertain result.

A warm and sheltered situation should be chosen, with a south-east, rather than a south-west aspect, the morning sun being more desirable than that which shines after noon. Timber is attainable on most farms. The requisite sawing into rough boards is obviously beyond the capability of domestic tools, and must be effected by sawyers either at a carpenter's, or by men who can be hired (at least in the southern part of the island this is done) to cut the timber on the premises. The boards can then be sawed into the requisite lengths, and sashes for the lights be formed to fit the frame. Good clear white glass is always to be preferred to that which is either green or knobbed, as it is desirable to secure as much of solar light as possible. Large panes are to be avoided, as they are not only very expensive in the first instance, but being more easily broken than small squares, are costly to replace when destroyed. Glass can be obtained in any town. The squares, or quarries, as they are termed, which will be found most suitable, are those which measure six inches by three inches; or else, five and a half inches by three and a half inches; they are more safe and manageable than a larger size, and if so glazed as to lap over one another not more than one-twelfth of an inch, afford ample light, and collect little dust between the laps.

The simplest frames may be constructed by driving four strong posts, correctly squared, firmly into the ground, and allowing three feet for the dung under the proposed base; nail at that height above the ground any strong rough boards to the posts. The dimensions of the frames vary, according to the object in view; they should be six feet wide from back to front, and not less than seven feet long, to admit of two lights at the least; three would be much better. Each should be from three feet three inches to three feet six inches wide, and they must be made to slide upon two strong pieces of smooth wood, attached to the two sides of the frame, and to a third in its middle to act as a rafter, let into the front and back boards of the frame. The depth from the surface of the dung, upon which the lower edges of the board rest, to the under surface of the lights, should be in front eighteen inches, and at the back three feet; this will admit of a sufficient slope, a position in which most frames are defective, causing a great loss of direct solar power, and admitting much drip, in consequence of the incapability of lights with a very depressed angle to carry off rain-water with sufficient rapidity. Round the frame is to be piled, till level with the top, fresh manure, which must be kept continually replenished, as fermentation ceases and the heat abates.

Before we proceed to give directions for building the peach-pit, we would impress upon our farming readers, for whose benefit this paper is written, the immense advantage they possess in commanding a constant supply of the chief material for raising forced fruits, either as luxuries or for sale. We have already alluded to the circumstance of enormous mixens or dung heaps, which in general are placed on some waste, distant corner of the farm, to ferment and mellow for months, in order to become in a fit state for the purposes of the land. By means of fresh dung, while it is yet useless for a farmer's crops, his hotbeds and pits might be rendered available, and his mixens turned to *double account.* The sulliage or drainage, too, as we shall hereafter shew, can be saved, and thus he would obtain a supply of that probably most valuable portion of the manure, which is, with too often ignorant improvidence, left to soak away from the wasting dung-heaps, injuring the ground for the space of many yards round the spot on which they stand.

We have endeavoured in the foregoing allusion to the economy of farm-yard manure, to point out a structure of the most simple character, without affecting to enter upon the minutiæ; any person of observation may readily acquire a knowledge of the form of a frame, the glazing of its lights, and the uses to which it may be applied; our hints, in the rough—for such only they are—tend to point out a certain object, not to enter upon horticultural details; though we will here observe, that if our well-meant advice be followed, and the builders of the several pits be tyros in the art of growing the produce for which they are intended, and would wish to be made acquainted with the methods which have been successful, we shall be happy to meet their wishes through the medium of these pages.

In our remarks upon the peach-pits and vine-pits, &c. a hint on the method of constructing them may not be unacceptable to the higher orders of agriculturists, to whom—indeed to every one—we cannot too earnestly point out the great advantage which will result from saving all liquid manure. It is wonderful to us, that, with this obvious fact ever before them "nothing is (or need be) lost in nature," farmers of every grade should omit to turn to account the valuable fermenting principle of their manure heaps! Unlike the certain expense of fuel, here is heat provided for their use; though we are far from objecting to the use of flues and other means of heating by fire, and intend (should our future hints be called for), to offer two or three excellent and extremely economical, as well as *portable*, methods, for the consideration of our readers.

The following plan for building a range of pits, we prefer to give, rather than our own, as it is calculated to effect a greater benefit to the farmer. It is that adopted by an able gardener, and one which we have had personal opportunities of investigating and approving.

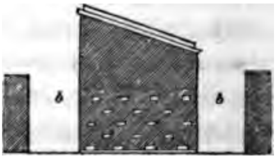
The pits are constructed in the following manner:—A space is set out of any given length, which, in a farm, will be determined by the quantity of recent dung that may be from time to time at command; but in the garden to which we allude, the width of the excavation is only ten feet and a half, by three feet deep. A nine-inch brick wall is built within this space, and serves to support the earth. The bottom ought to be paved, and made water-tight; and from it draining tiles, or iron gratings, should carry off the manure, by means of conduit pipes, to a reservoir prepared for that purpose. The pits for forcing are built within this space,—are nearly five feet wide, and of the same height at the back wall. They, however, admit of modification; but on this point we will let Mr Patrick speak for himself.

> "Pits of this size," he says, "have a decided advantage over larger ones for early work, as they keep up a quicker and more lively heat, with much less expense than if they were larger; because, the larger the pit, the stronger must be the lining. The range has nineteen lights; it begins with two lights, and ends with the same; but the intervening space is divided into pits of three lights each, all the divisions having openings between them of twelve inches wide, so that three, six, or more lights, as required, may be worked in succession."

The whole of the space between the nine-inch wall and the pits, is to be filled with warm dung at the first, but subsequently, that manure which is in the open spaces between each end of the pits (twelve inches wide), as at *a*, fig. 2, is not to be turned or refreshed, like the linings in front and at the back of the pits; because, as the brickwork is pigeon-holed, and without the flues at the end, the roots will pass through, and receive much nourishment from the cool, decayed dung lying in these narrow spaces. These openings between the divisions are serviceable in cold and damp weather, as they facilitate the work of topping-up *all round* with fresh dung.

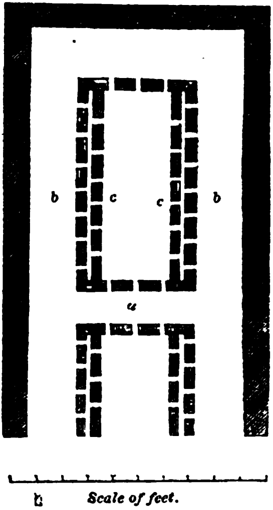
The figures exhibit a two-fold view of the pits. Fig. 1. is the elevation, shewing the end of one of them, with the four ranges of pigeon-holes, and the height of the external walls: the slope of the lights is also given. The pits are of four-inch work, and not more than four feet six inches to five feet wide, external measure. Fig. 2. shews the ground-

Fig. 1.



plan. The range described by Mr Patrick begins and finishes with a two-light pit; but our fig. 2. exhibits one of the pits for those lights with the order of the pigeon-holes; and the half of an adjoining pit, with one end of the openings between their ends at *a*. The outer pit-walls, *b b*, are of four-inch work, pigeon-holed all round, as shewn in fig. 1. The inner pit-walls, *c c*, are worked up solid—brick-on-edge—excepting one row at the bottom (seen in fig. 2.) which is pigeon-holed for the sake of drainage. This inner pit-wall must be brought up one course higher than the pigeon-holes of the outer pit wall; and by covering the cavity between the two walls with a double layer of plain thin six-inch tiles, a flue is formed back and front on each pit. The flat tiles must be laid on double, because it is necessary that the flue be rendered steam-tight, which it will, by laying the middle of each tile of the second course exactly over the joint formed by two tiles of the lower course all securely bedded in mortar.

Fig. 2.



"The advantage of this flue," says Mr Patrick, "must be obvious to the most superficial observer; as, by it, the violent bottom heat from the linings—which is the bane of all forcing—is moderated; and, as much of the heat is transmitted through the tiles, it diffuses a mild and genial warmth, which is circulated among the plants, without there being any danger of too much heat among the roots."

The cavity for the back and front linings between the nine-inch wall and the pits, is shewn in both figures at *b*. The centre of the pits is filled up entirely with mould as high as the flue tiles; and for cucumbers, the best and sweetest soil is produced by the gradual decay of couch grass, collected from fields of light mellow loam; for melons, the chopped green turf of an alluvial meadow, quite free from manure. Under the mould for the cucumbers, however, there should be a layer, six inches thick, of fresh turf chopped in pieces, to serve as drainage; this material is found most suitable, "and the plants will shew the benefit they derive from it, as soon as their roots begin to touch it." Persian melons (Housanee especially), grow admirably in these pits, trained on a trellis, a few inches under the lights. When we come to treat on the culture, stopping, pruning, &c. of the several plants, we shall advocate the general adoption of the exquisite and delicate Housanee melon, in preference to those coarse flavoured, rank scented, vulgar disgusting things, almost exclusively cultivated in this country; the rock, the Spanish, &c. are far below a turnip in taste, smell, and texture, while the ship loads of filthy, half-ripe, half-decayed melons, that find their way over from Holland, are enough to cause a loathing for the fruit, and we are not surprised at the slight estimation in which it is generally held; on the contrary, we never met with a *melon hater* who did not admire the delicious Housanee.*

When pine-apples are grown in these pits, in lieu of the internal bed of earth, they are placed in pots, which are plunged half-depth in a two-feet shallow stratum of stable long dung, which soon settles to fifteen inches, with little bottom heat. Thus treated, the plants thrive rapidly, and in a year become rich in verdure, and of a magnificent size.

If peaches, nectarines, and grapes, be contemplated, the principles of external walls and dung and intermediate linings should be still adhered to, but the pits for these fruits should be six feet wide, and one foot higher. The pigeon-holes will not be required, but walls of four-inch work may be carried up all round, and linings being applied, will communicate sufficient heat, to bring the fruit to a correspondent early state of maturity.

Fruit of a very superior quality always commands a good sale; and, grown under glass, is not only much earlier in the market, but is preserved from injury from external causes, and will repay the industrious grower.

---

* It may not be irrelevant to mention here in corroboration of the sentiments expressed by our correspondent, of the facility that farmers possess of raising many luxuries which they neglect, perhaps from want of thought, that when we were learning farming in Berwickshire, we amused ourselves one season with raising, in an old frame of two lights, with very little trouble, *twenty-six* netted Cantelupe melons, of good size and fine flavour, besides many excellent cucumbers, which were allowed to form their fruit in the open air.—EDITOR.

Before we close this paper, we would offer a few remarks upon the prevailing fashion, in the southern end of the island, of prize fruits and flowers; against the cultivation of which, we enter our protest; and are anxious that the foregoing observations should not lead to a habit which, from all we see and know, is injurious, rather than beneficial, to the industrious classes. We believe that the encouragement given to the emulation of our poorer brethren, by the rich, had its origin in benevolence; but we also believe that kindness, though well meant, may be short-sighted and prejudicial; and when the prize system leads to loss of time, to gambling, to "abusing the good gifts of God," by extra and expensive drinking, it must be obvious that the system of cultivating for prizes is, to say the least of it, susceptible of improvement. We have long lamented the spread of those questionable societies, and wished to lift up our *single* (as we supposed) voice against them, when we were agreeably taken by surprise, to meet with observations in a contemporary periodical, the *British Farmer's Magazine* for October 1838, which bear upon this very subject. Before we quote from the article in question, we would remark upon the different appearance that a cottager's garden presents, (and which, when filled with flowers of easy cultivation, is one of the prettiest sights,) from the shabby bit of ground, called by that name, that is devoted to the cultivation of one or two shrubs intended to enter the lists as prizes. A wide waste around the tree or flower—beds trampled as flat as the high road—garden pots—bits of tin—rags put up as screens—their loitering neighbours, with envy in their hearts—the anxious jealous owner—idle children rolling over the waste space which they could so easily be won to cultivate, and in which they would take such honest pride and delight, if redolent of sweets raised by their own happy industry! Mr Brereton, the writer in the *Brit. Farm. Mag.*, after some excellent remarks, thus continues:—

> "There is, however, a wide difference between the cottar having a few simple flowers in his garden which require but little care, and having those which require a great deal of care, and which, indeed, take so much of his leisure time. It is very true, that even this sort of cultivation will, for the time, if strictly followed, help to keep him out of the public house; but when the show-day comes, and he is so fortunate as to win a prize, how

often are the fond hopes of the donor disappointed, on finding the winner rioting in the beer shop, till much more than the amount of his prize is consumed! Gentlemen who have competed at flower shows for years, have been compelled to abandon their favourite pursuit for a similar reason; for, if they were successful, it had the effect of sending their gardener to the alehouse for days together, to boast of his ability, and drink success to his further efforts.

"The time swallowed up by prize-culture amounts to a heavy total, as I have had opportunity of proving. In a small village in a rural district where I was located for some time, I saw to what extent a man's fondness for prize gooseberry growing carried him. Whatever time I rose in a morning, he was sure to be in his garden; but it gave me no pleasure to see him there—as he sadly neglected his business for his favourite hobby—although at times I could not keep from laughing at his extreme anxiety. His workshop window fronted his garden, and if a poor thrush came unconsciously near the sacred fruit, he instantly shot it. If a thunder-shower came on, then he ran out to cover his trees, as the heavy rain might soon knock off the berries, already burdensome to the branches on which they grew; when it became fair, of course he came out to remove the covering; then, if a strong gleam of sunshine followed, out he came again to ward it off, as he did the rain; and if the sky again became cloudy, he failed not to remove the covers. So that with the rain, the sunshine, the gloom, and the unmerciful persecution of the birds, (whose carcasses lay thickly strewn on the garden hedges,) no small portion of time was wasted. Besides this, there was the extreme pruning of the tree, the thinning of the berries, the placing a bottle or jar under each to encircle it, to make it swell, the propping up of the branches, &c. And what was all this trouble for? Was he to receive a commensurate reward? No! he ran the chance of winning a copper tea-kettle, or half a dozen of silver tea-spoons, with, of course, a *little* honour; but he had also the chance of losing; and, despite of his winnings, lose he surely did. He lost his business; his effects were sold to satisfy the demands his folly had created; and he went pennyless from the village, where he once had been a man of some substance."

Very much more is added in the same strain of good sense, but our limits preclude further quotation.

ON THE OX TRIBE, IN CONNEXION WITH THE WHITE CATTLE OF THE HAMILTON AND CHILLINGHAM BREEDS.

By the Rev. WILLIAM PATRICK, Hamilton.

The genus Bos, with its species and varieties, has long been a puzzle which has exceeded the sagacity, and united researches, of the naturalist and agriculturist. To say what was the original type of the endless herds of cattle, which roam over the extensive wastes of the continents of the Old and New Worlds, or to attempt to identify them with our various domestic breeds, would require more knowledge than science has yet brought to light, and more observation than is ever likely to fall to the lot of our common experience. The naturalist may indicate species, and enumerate varieties, but he can unite the whole by no common or connecting link. The external appearance and markings of particular individuals, as types of the specific races to which they belong, have been pretty well ascertained; but as to their internal structure, the organic peculiarities, or natural indices, which permanently stamp the specific differences between one breed or section of cattle and another, little or no progress has been made. Nor is this much to be wondered at. The same puzzle is to be met with in other departments of nature. Let us take, for example, the horse. Although it be well distinguished in generic character from all other animals, yet when we come to identify species, or to describe or account for the endless varieties, of that useful and generous creature, we shall find that our *progress* is at a *stand*, and that any assumed knowledge we may possess on the subject, is an accumulation of words, rather than of ideas. The two extremes, in so far as size may be viewed as the mark of a variety, were strikingly exhibited at the late great agricultural show at Glasgow, between Mr Steedman's fine black draught horse, and the little pony stallion from Shetland; yet there are intermediate varieties, of all shapes, sizes, and appearances. But which breed, or sort, may be viewed as the common origin of all these whims and vagaries in the rearing of the horse, is quite another question, and is not likely soon to be decided. The same perplexing and tantalizing general affinities, with marked specific differences, or accidental varieties, are also to be observed in the canis family, or dog genus. Linnæus mentions no less than thirty-four varieties of this animal, and many of them are as unlike each other, as the Clydesdale stallion, and the Shetland pony. Dr Fleming, in his "History of British Animals," enumerates nineteen varieties of the dog which occur in the United Kingdom. Several of these are of great antiquity, and have been celebrated for their excellence, by Appian, Grotius, Claudian, and others. These animals, in general, are so completely domesticated, and are so wedded in their attachments to the society of man, that it has been questioned, whether the dog was ever found in a truly wild state. Many attempts have been made to trace all these varieties to one common origin, but the attempt has hitherto failed, and is believed to be beyond the reach of science, or the most dexterous use of the scalpel, or dissecting knife. The effects of domestication upon animals has been long known. It is a sort of education of the physical frame, so that we may say of the organized body, as well as of the spiritual mind—

> "Just as the twig is bent, the tree's inclined."

The propensity to change with circumstances, is an organic propensity, and is not confined to the animal world. In the vegetable kingdom, we see a remarkable analogy in the history of the cereal tribe of plants, and our domestic animals. Wheat, barley, and oats, may be said to occupy the same relative position, in regard to plants, that we usually assign to the horse, ox, and dog, in the animal kingdom. In each instance the individuals have been so long domesticated, that research has hitherto failed in every attempt to identify them in a wild state, or to trace them back, with a few exceptions, to a common origin. The varieties in each are equally puzzling; they *vary*, and yet they are the *same;* and still, in their sameness, there are remarkable differences. Botanists enumerate about twenty-two species of wheat, besides numberless varieties of Triticum æstivum, *summer or spring wheat*, and Triticum hybernum, *winter or common wheat.* There are at least fifty varieties of *spring wheat*, which itself is probably only a variety of the *common wheat.* The varieties of this last are endless. It has been supposed, that the spring wheat has been traced to Sicily, where it grows wild, but this is very doubtful; and, as to the common wheat, no person has hitherto, with any degree of probability, traced it to its native clime. This, like other organized bodies, when exposed to a change of circumstances, is greatly affected in its habit, size, and mode of growth. These remarks apply, more or less, to all species of the gramineous tribes. It has been long ago remarked, that were some plants of our *annual gramina*, and even our different species of corn, to be placed in favourable, mild, and moist situations, not too much crowded together, and by repeated and timeous cropping, to have their early stems prevented from rising too much, so as to withdraw the sap, and exclude the sun's rays, and air, from the after springing ones, a series of vigorous buds might evolve through successive years, and the appearance, for it is nothing more, of the species being perennial, would again occur. This striking change has been induced on different species of corn, by all accounts, where the seed of such has been accidentally dropt, and the plants have been allowed to grow, in a situation calculated to preserve them. The reproductive properties of plants, are equally under the influence of circumstances. It has been stated, that a single grain of wheat, by taking off and planting the successive shoots arising from the transplanted ones, as they attained a size permitting that treatment, in the course of eighteen months, in a green-house, was so multiplied, as to produce, of ripened seed, between three and four pecks.

Barley, if we may judge from the Scripture records, and also from the pages of many of the classical writers of antiquity, was formerly the staple article of food, and was much more extensively cultivated than wheat. It was one of the principal grains which went on various occasions to sustain the armies of Israel; and it was probably selected for some special purpose, both for men and animals, who had to undergo a great deal of fatigue, particularly the wrestlers and unfortunate gladiators of the Roman circus, who were thence termed hordearii, or *barley-men*. But the early use and culture of this grain is the grand reason why its history is entirely lost, and no one can determine its original or native country. It is needless to repeat the old assertion of Cardon, that it is found wild, or in a native state, in Athol, in Argyleshire; or of Reidesel, who pleads for Sicily. Seeing we know nothing on the subject, it is best to go back with Diodorus Siculus, at once, to the region of fable, and ascribe the first ulcture of barley to Osiris. Botanists make about nine species of barley, and the varieties are endless. Even the oat, which in this country has arrogated to itself the exclusive name of *corn*, can boast of twenty-five species; and it is believed Linnæus has omitted two or three species more. Of the *Avena sativa*, or cultivated oat, there are numberless varieties, some known to writers, and others not yet recorded. But as to the native place of growth of this, or any other sort of grain now cultivated in Europe, nothing, as we have seen, has been satisfactorily ascertained.

It would thus appear, that among our domestic animals, and our common cereal crops, there is an amalgamating of nature and art, a mingling of original and natural qualities, with accidental circumstances, and adventitious and foreign aids, which have accumulated so far, and for such a length of time, that it is now hard to say, whether nature has been swallowed up in art, or art swallowed up in nature. The ox tribe, the most common, and by many degrees the most useful, of all the domestic creatures which the art of man has subdued, and subjected to his use, may, perhaps, for these very reasons, be made to stand forth as the type of these mystical creatures, which seem to have made one step in advance of the *feræ naturæ*, and by domestication, have, like the superior race, with whom they associate, thrown off the savage, and partly assumed the emblems of civilized life. I believe all the species and varieties of the ox tribe have not yet been described with any thing like accuracy. This is a task which no individual can accomplish. They are scattered over the face of the earth, and can, therefore, only occasionally be seen, by occasional observers. One individual may observe one peculiarity, and another individual another,—but no one individual can investigate the whole. Whoever, therefore, may add anything, even a drop, to the great stream of natural science, is doing an essential service to science at large, and every such attempt ought to be encouraged, instead of being sneered at, and misrepresented, as is sometimes done by naturalists, when speaking or writing of each other. In the present state of zoological science, we have no great or indisputable authority, to whom we can refer; and as we cannot gather all our knowledge from actual observation, we must just take it as we can best obtain it. In casting about for the different sources of information which may be safely consulted concerning the various known species of the ox, I believe there are none more *generally* correct, or more worthy of being relied on, than the works of Linnæus, lately published by Dr Turton. The characters, indeed, are generally drawn from external circumstances, and some of the marks are not always permanent. Thus, a great many species are identified by the horn, although some varieties, like the Galloways, have no horns, still the classification, as matters go, is perhaps the best that can be had for general purposes; and as it is not proposed to fix upon these as complete or specific descriptions, but merely as a general result, from which some particular conclusions may be elicited, the Linnæan catalogue of the ox tribe, imperfect as it is, will answer the purpose for which it has been designed.

Linnæus' generic description of the ox is "horns hollow, bent outwards and forwards, semicircular, smooth; eight lower *fore teeth* and no tusks." Among their peculiarities, he says they "fight by pushing with the horns, delight in low rich pasture, are useful for draught and burden, and valuable for their flesh, milk, hides, and many domestic purposes." He mentions nine or ten different species. The first species, *Taurus*, is briefly described as having horns round, turned *outwards*; dewlaps lax. Under this species he enumerates the following varieties:—1. The *Wild Ox*, with short thick horns, *reflected* back, and a curly forehead. 2. *Bonassus*, with horns bent back, and a very long mane. 3. *Bison.*—Horns bent forwards, the back curved or gibbous, the mane long. The European Ox, which he seems to imagine of the same species with the above, he represents as differing from it in having smooth round horns, distant at the base, bent *forwards*. Under this very general description he ranks the following varieties:—1. *Indian Ox.*—Horns short, bending back *close to the neck*; body red; a fatty bunch on the shoulders. 2. *Zebu.*—Horns nearly erect, *turned forwards*; a fatty bunch on the shoulders. 3. *Surat Ox.*—Diminutive size of a large dog. 4. *Abyssinian Ox.*—Horns loose, pendulous, *adhering only to the skin*; back with a bunch. 5. *Madagascar Ox.*—Ears hanging down as in the pointer dog;

back curved or gibbous, size large; body white. 6. *Tinian Ox.*—Body white; ears black. 7. *African Ox.*—Body snowy; legs slender; horns elegant; hoofs black; very swift. These are all the varieties supposed to be deducible from, or similar to, the European Ox. The following are also supposed to be distinct species.

1. The *Arnee*, a native of India. It is of vast size, seven or eight feet high, and its colour black. The horns are long and wrinkled, curving like a semicircle, with smooth round tips, nearly approaching.

2. *American Ox.*—This is a large, fierce, and dangerous animal, frequenting the reedy marshes of South America. The horns are short, black, distant at the base, pointing outwards. The mane is long and woolly; the back circular or gibbous; the gibbosity large and fleshy; the neck thick; the hinder parts weak and slender; tail a foot long, tufted. The hair upon the head and bunch is long, woolly, waving, rusty-brown.

3. *Musk Ox.*—An inhabitant of North America, observed in herds among rocky mountains; it runs and climbs well. This is an animal with a gibbous shoulder; a dusky mane, tinged reddish; long black silky hair on the body; under the hair a fine ashy fleece. The ears are erect, pointed, dilated in the middle; the horns approach at the base, are broad, bent inwards and backwards; tips bent outwards and pointed. The flesh is of a musky flavour.

4. *Grunting Ox.*—This animal is a native of Thibet, and is reared extensively in Siberia, China, Persia, and India. Like our own ox, it is subject to many varieties from domestication, and is sometimes hornless. It is described by Linnæus as large, fierce, impatient of heat, fearful of any thing red, shakes the body when irritated, and, instead of bellowing, grunts like a pig. The head short; nose broad; lips thick, pendulous; ears large, pendulous, hairy; horns short, slender, distant, with very sharp points and a tuft of hair between; hair on the forehead in rays; mane white, extending to the tail; body black; hoofs broad; tail broad, about six feet long, covered with long, silky, silvery hairs; flesh rank, except when very young. Large balls of hair, called bezoars, are sometimes found in the stomach, as among our domestic cattle.

5. *Buffalo.*—A native of Asia, but domesticated in Africa, India, and Italy. It is usually of the size of a cow, and is gravid twelve months. The skin is tough; the hair scanty, black, or dusky; head small, with curly hair on the forehead; horns black, thick; nose broad; eyes white; tail short, slender; it has no dewlap. The horns are what naturalists term resupinate, turned inwards, flat on the foreside. There are at least three varieties of the Buffalo, 1. With small pointed taper horns, compressed sideways and resupinate; the rump and thighs are without hair. 2. With a gibbous back; lower half of the legs white. 3. A variety about the size of a sheep, very fierce and pugnacious.

6. *Cape Ox.*—It inhabits Africa and Guinea. This is a large, strong, and fierce animal, lives in woods, wallows in mire, is dangerous to travellers, and sometimes tramples men, horses, and oxen under its feet. It is between five and six feet high, and so swift, that in running up hill, it is not easily overtaken by a horse. The body is black or dark-ash; face covered with long harsh hair; horns thick, black, laid flat on the head; skin tough; ears hanging; tail short, tufted, black at the tip; horns broad, approaching at the base, and then divaricating backwards; tips turned upwards and inwards; mane short; flesh coarse, of the flavour of venison.

7. *Baas.*—This is an animal larger than an ox, of a grey colour, and is a native of Africa, north of the Cape. It has short horns, with the chest and chin bearded.

8. *Dwarf Ox.*—Also a native of Africa; a very handsome animal, less than a stag. The shoulders are a little elevated; the hair tawny-brown, shining; tail with long coarse hair at the end; horns nearly erect, close at the base, then divergent and approaching at the tips.

In the above catalogue we have a *vidimus* of all the known oxen, their species, and principal varieties. There can scarcely be a doubt that when subjected to the scrutiny of modern philosophical research, that, scientifically speaking, there may be something to add, and perhaps, more to retrench,—varieties may be mistaken for species, and species for varieties; but take it all in all, it is the best catalogue for general, or even for scientific purposes, which human learning or ingenuity has yet been able to produce. Cuvier, in his adaptation of comparative anatomy to his eryctological researches, has, indeed, thrown new and unexpected light upon the physical structure of various tribes of animals; but his labours, from the difficulty of the task, are limited, and it is only in the higher walks of science that his dogmas have yet become "current coin." He agrees with Linnæus so far that the Cape Ox, or Bos-Caffre, as it is called, is a distinct species from the common Indian Ox, and that both of these are distinct species from the Buffalo. His attention has also been directed to the American Buffalo, as "a species distinct from all others;" but he supposes the Arnee, which Linnæus makes a species, a mere variety of the common Indian Buffalo.

In casting the eye over the above list, the experienced breeder will find some difficulty in fixing on particular species as the *type*, of which our common multifarious races of domestic cattle are the *anti-types;* perhaps he may be disposed to doubt or to deny a common origin, and to attribute the whole to original conformation, or to such causes or accidents as occur to his own mind, which is fair enough, if they be not of that description which philosophers have termed "prejudices of opinion." The endless varieties of cattle which now abound in this and other civilized countries is, indeed, a topic sufficiently curious and important, to inlist the attention of the most careless observer, or to tax the faculties of the most profound inquirer into the "ways of nature." But although curious, these phenomena are not unnatural or inexplicable; and when disposed to reflect or generalize on the subject, we need not proceed far for evidence that there is a principle of *accommodation* in nature, and that this principle is called into operation by the activity and superior intelligence of man. Nature may, therefore, be seen in two forms,—in her native wild, untamed, and savage grandeur, and as it were, in a state of domestication, corrected and modified by peculiar causes, and accidental circumstances; and these remarks extend to all organized beings,—to the vegetable, as well as to the animal kingdom. If we proceed to the kitchen garden, a thousand instances are pressed upon our attention. The small white and tasteless root of the wild carrot, can no longer be recognised in the large succulent, and highly-flavoured red or yellow carrot of our gardens, and the small and acrid parsnip (*Pastinaca sativa*) under the hands of the gardener, becomes large and nutricious, retaining only its sweetness, without any portion of its former acrimony. Cultivation, a greater or less degree of nourishment, or in the change of colour, probably the different combinations with oxygen, or with acids, are most likely the primary causes of many of these anomalies, but the *mode* of operation is unknown; accident presenting them to us at first, the skill and industry of man is directed to their continuance, and fully rewards his labours. The orchard is also full of evidences, that nature, under certain circumstances, is influenced and modified by the appliances of art. The crab-tree, in its native situation, is small, useless, and covered with *thorns*; cultivation increases its size, the thorns *disappear*, or change into branches, bearing fruit, large, juicy, and of the most delicious flavour. But the fruit not only improves in size and flavour, but is also subject to vary in colour. The Royal wilding is entirely white, the parson and Kentish pippin, green; others are greyish, as the fenuillot, or the pomme d'Anis; or brownish green, as the russets. Some are entirely red or yellow, and others streaked with yellow, red, or green; and a variety, brought from Petersburgh, is so transparent, that the kernels may be perfectly seen, when the apple is held up to the light. Many other fruits present the same varieties as the apple; and, in the flower-garden, nature seems no less subject to the sway of " magic art." Various species change in their roots, stems, flowers, and fruit,—and there is no depending upon colour. In some species red changes to white, in others to blue, yellow, or buff. Blue often changes to white, or even to red and yellow. Purple or violet changes to white, and to red and yellow. Yellow changes to white, red, blue, purple, buff, copper-colour, or brown. White changes to blue, purple, red, or yellow. In many of the Iris tribe, the hue varies exceedingly. The trident-petaled Iris (*Iris tricuspis*) is found with white, straw-coloured, yellow, pale blue, and blush-coloured petals; and the small bulbous-rooted Iris (*Iris xephium*) with white, yellow, purple, violet, and blue flowers.

An astonishing number of varieties of colour, and its different combinations, have been produced in flowers, especially in the pink, carnation, hyacinth, anemone, ranunculus, and tulip—

> ——— " and while they break
> On the charmed eye, the exulting florist marks
> With secret pride the wonders of his hand."

Mr Hopkirk, in his " Flora Anomia," has noticed multitudes of similar anomalies; they are, indeed, familiar to every florist, or gardener. But the Dutch have, perhaps, carried the *cultivation* of nature to the greatest extent in this department. In one of their catalogues we find above two hundred distinct varieties of anemone, three hundred of the hyacinth, seven hundred of the ranunculus, and above nine hundred varieties of tulip. In these we find red, blue, white, yellow, and green hyacinths, with all the intermediate shades; red, yellow, and white tulips, and these broken with brown, cherry, rose, yellow, and violet colours; purple, grey, coffee-coloured, brown, crimson, red, rose, orange, yellow, white, olive, green-coloured ranunculuses, and each of these variously intermixed.

Both in domestic flowers, and in domestic animals, as the poet sings—

> " Nature must give way to art."

And when man begins to contemplate the extent of his labour or skill, he is like one " caught in his own net," and feels it not easy to extricate himself.

We have seen, that in the vegetable kingdom all these varieties are referable to one original and distinct species,—and that numerous and dissimilar as they may appear, they are all the descendants of a parent stock. Here a very interesting question arises, in reference to the varieties in our common breed of cattle, Are their distinguishing peculiarities original or permanent, or are they accidental and mutable? Or in other words, Are the different breeds of the same species of animals always and invariably distinct; or are they capable of being changed, in such a manner, as to possess few of their former qualities, and to constitute, as it were, another variety? I have been at the pains to consult Mr Cline on this subject, whose work, entitled, " Observations on Domestic Animals," although now old and scarce, is very valuable, and is evidently grounded on practical views of the subject. The question seems to have excited considerable interest in his day, some writers being of opinion, that the different breeds of each species of domestic animals were originally, and are still really distinct sorts, endowed with the power of transmitting to their posterity, all their distinguishing properties, with little, if any alteration, providing they be kept from mixing with other breeds; and others ascribing to the influence of local or adventitious circumstances all the striking differences now found to subsist among the same species of animals. Mr Cline very justly remarks, that this discordance of opinion may be accounted for as follows. Some observers having discovered that certain properties were less steady when circumstances were changed, have been disposed to conclude, that all are more or less mutable, and more or less rapidly so, according to the influence of the changing powers. Other persons again, collecting their observations in a situation where circumstances were less varied, and where, of course, alterations on the form or character of animals were less frequent and striking, have been led to draw an opposite conclusion, and to hold, that the appropriate qualities were innate and immutable. Both of these sentiments Mr Cline believes to be erroneous; though it must be admitted, that in certain points of view, neither of them wants some shew of argument in its favour. From a consideration of various circumstances, it is probable, the two following conclusions may be admitted. In the first place, the nature of their food, climate, and other circumstances, seem capable of altering, in a more or less slow and gradual manner, the character and form of all animals, and in the end, remarkably, the properties of any particular race or family that has been subjected to the continual operation of such changing powers. The alteration, indeed, from the previous state, may be apparently little in an individual; but the change in the parents being more or less communicated or superadded to a similar one in the progeny, the difference so produced from the original state of the same race, must, *in time*, become pretty striking and important. But, in the next place, facts and numerous observations tend also to establish this conclusion, that the different breeds or varieties of our domestic animals are, in general, so fixed, and incapable of speedy alteration, that they may be deemed comparatively *permanent;* and that, when subjected to the influence of circumstances, which have not *much power*, the individuals cannot be greatly affected by it, and no material change may ensue, even for many generations. In situations nearly similar, though distant, if any change take place, it will be so insignificant, that breeders may reap the advantages arising from the possession of the best improved sorts, without the labour and expense of *original refinement*, which, to any considerable length, it might, in many cases, be difficult, if not impossible to accomplish. These conclusions are moderate and sensible, and seem to conduct to the safest *practice*. They will instruct the husbandman, that the most pure and perfect races may be debased by improper mixture, and injured by improper treatment,—that indiscriminate matches in breeding, and inattentive management in rearing, are alike capable of producing a worthless progeny.

It now becomes a matter of some interest, not less to the philosopher than to the practical breeder, to inquire whether, among all the known descriptions of British live stock, we have any breed or breeds which may be regarded as distinct *species*, or whether those ought only to be ranked as *varieties*—always premising that by a *species* we are to understand a succession of individuals springing from one another by a direct and constant generation without alteration of kind, and always producing their likeness—while, on the other hand, we are to regard as a *variety* every or any deviation from the common or natural appearance of a species, caused by some accidental circumstance, which being removed, it again assumes its original figure. In short, the *species* continues to produce its kind—the variety not *always*, but only for a longer or shorter time, when it is again swallowed up in its *species*.

In this country, we have at present two breeds of cattle under very different *circumstances*, which no doubt operate powerfully upon their original qualities and more mutable and tangible properties, namely, the domesticated kinds of stock which are now reared entirely for profit, and are, therefore, subject to all the vicissitudes which avarice, caprice, or honourable competition may suggest or execute.. These, like the face of society itself, are in a state of continual and successive fluctuation, and are always undergoing changes in a greater or lesser degree. On the contrary, we have a kind of stock which is not subject to these vicissitudes; it is not kept for profit, and it is not accordingly subjected, like other stock, to the manipulations and artifices of man. It is in a state of wild nature—living upon a rough uncultivated herbage, left to its own wants and caprices, exposed to all the vicissitudes and inclemency of the weather, and all these circumstances have been in operation from an unknown antiquity—the breed here alluded to is that of Cadzow Forest, and Chillingham Park. Were we, therefore, disposed to inquire into the original of our domestic cattle, it is to this quarter that our attention would be naturally directed. The first account which we have of the Chillingham Park cattle does not date farther back than 1797, and appears in the "General View of the Agriculture of Northumberland," by J. Bailey and G. Culley. These gentlemen remark, that it is probable "they are the only remains of the *true and genuine* breed of that species of cattle;" and in a note they farther state, "we are no strangers that there may be found in two or three different parks of the kingdom, breeds of cattle which pass under the denomination of *wild cattle;* but are inclined to believe that they have been *contaminated by crossing*, and that those in Chillingham Park are the only remains which answer the description given by Boethius of this species of cattle." At a late meeting of the British Association at Newcastle, Mr Hindmarsh reiterated similar sentiments, and Lord Tankerville, adhering to the expressions of Bailey and Culley, when speaking of the Hamilton cattle, supposes them to be a "degenerated breed." The Penny Magazine and Athenæum follow in the wake, and thus are ignorance fostered and falsehood propagated. More anxiety seems to be displayed in establishing the *exclusiveness* of the breed, than in ascertaining its antiquity, but of this more in its proper place.

In looking over the catalogue of the ox tribe by Linnæus, the nearest affinity seems to be the Tinian and African ox, which are the sixth and seventh varieties under the European ox. The description given by that distinguished naturalist of the one is, "body white, ears black," and of the other, "body snowy, legs slender, horns elegant, hoofs black, very swift." Whether all resemblance stops with these external appearances, I have no means of ascertaining. But it appears that both are the offspring of one common race, and are very similar in their habits—both are in a wild or semi-wild state—but, of course, great varieties must be produced by food and climate.

Lord Tankerville informs us that there are also herds of white cattle at Lyme Park and Chartley Park. Those at Lyme Park he has not seen, but those at Chartley Park resemble the Chillingham breed "in every particular in their colour, except some small difference in the colour of their ears, their size, general appearance, and, as well as I could recollect, in their habits." When speaking of the Hamilton breed, he says, "those at Hamilton, or rather Chatelherault, I have seen, and they in no degree resemble those at Chillingham. They have no beauty, no marks of high breeding, *no wild habits*, being kept, when I saw them, in a sort of *paddock*; and I could hear no history or tradition about them which entitled them to be called wild cattle." It is evident that his Lordship's visit at Hamilton must have been of a very short and unsatisfactory nature—his notice of the wild cattle, short as it is, is full of blunders, and to a person well acquainted with the circumstances and localities, almost ridiculously so. These white cattle are generally denominated the Hamilton breed of cattle, but his Lordship tells us they are not found at Hamilton, but at Chatelherault; while the fact is, they are not found there, and never were, but considerably to the west. The noble chase in which they feed is a high pasturage, fringed on all sides with waving woods, and studded over with some hundreds of the oldest and finest oaks in Scotland, or perhaps in the island, amounting in all to fifteen or sixteen hundred Scots acres—a prospect never witnessed by the stranger without mingling feelings of awe, admiration, and delight—and yet Lord Tankerville could only see a "paddock." His Lordship could find no tradition of these cattle—the country is full of traditions concerning them—no person doubts their antiquity—strangers from a distance constantly visit them—and when relations or friends are on a visit to any of the inhabitants of Hamilton, the first place they generally go is to see the "white kye."

I am inclined to believe, from the principles already laid down, that the Hamilton breed of cattle is the oldest in Scotland, or perhaps in Britain. Having lived long in the neighbourhood, and being constantly in the habit of seeing and studying them, I can testify, from personal observation, that although Lord Tankerville has said they have "no wild habits," that this is well known to be one of their remarkable features. It would be unnecessary to repeat again the account lately given of them in the Naturalist's Library, which is correct in every particular, but which it would seem Lord Tankerville has not seen. I may state, however, a few peculiarities, and those the most striking.

It is remarkable that these cattle in browsing their extensive pasture, always keep close together, and never scatter or straggle over it like other cattle. In searching for them if you find one, be assured all the rest are at hand. This is a peculiarity which does not belong to the Kyloe, or any other breed, from the wildest or most inhospitable regions of the Highlands. Many years ago the Duke of Hamilton brought many herds of cattle from the Island of Arran to be fed at Chatelherault, but although newly imported from regions where nothing but wildness and desolation reign, I never saw them keep together like the white cattle, but might have found them straggling all over the park, ample and capacious as it was. The white cows are also remarkable for the systematic manner in which they pursue their sole occupation, the "gathering of their daily food." This is no random occupation, no "anyhow" system of feeding, but seems to be conducted by a rare instinct, which is greatly blunted, if not entirely lost, in completely domesticated animals. At different periods of the year their tactics are different, but to those acquainted with their habits, they are always found *about* the same part of the forest at the same hour of the day. In the height of summer they always *bivouac* for the night towards the northern extremity of the forest; from this point they start in the morning, and browse to the southern extremity, and return at sunset to their old *rendezvous;* and during these perambulations they always feed *en masse.*

The bulls are seldom ill-natured, but when they are so, they display a disposition more than ordinarily savage, cunning, pertinacious, and revengeful. A poor bird-catcher, when exercising his vocation among the "Old Oaks," as the park is familiarly called, chanced to be attacked by a savage bull. By great exertion he gained a tree before his antagonist made up to him. Here he had occasion to observe the habits of the animal. It did not roar or bellow, but merely grunted, the whole body quivered with passion and savage rage, and he frequently attacked the tree with his head and hoofs. Finding all to no purpose, he left off the vain attempt, began to browse, and removed to some distance from the tree. The bird-catcher tried to descend, but this watchful Cerberus was again instantly at his post, and it was not till after six hours imprisonment, and various bouts at "bo-peep" as above, that the unfortunate man was relieved by some shepherds with their dogs. A writer's apprentice who had been at the village of Quarter on business, and who returned by the "Oaks" as a "near-hand cut," was also sadly beleaguered by one of these savage brutes. He was attacked in a summer evening near the northern extremity of the forest, was fortunate, however, in getting into a tree, but was watched by the bull, and kept there during the whole of the night, and till near two o'clock next day.

These animals are never taken and killed like other cattle, but are always shot in the field. I once went to see a bull and some cows destroyed in this manner—not by any means for the sake of the sight—but to observe the manner and habits of the animal under peculiar circumstances. When the shooters approached, they, as usual, scampered off in a body, then stood still, tossed their heads on high, and seemed to snuff the wind; this manœuvre was often repeated, till they got so hard pressed (and seemingly having a sort of half-idea of the tragedy which was to be performed), they at length ran furiously in a mass, always preferring the sides of the fences, and sheltered situations, and dexterously taking advantage of any inequality in the ground, or other circumstances, to conceal themselves from the assailing foe. In their flight the bulls, or stronger of the flock, always took the lead, a smoke ascended from them which could be seen at a great distance, and they were often so close together like sheep, that a carpet would have covered them. The cows which had young, on the first "tug of war," all retreated to the thickets where their calves were concealed, where, from prudential motives, they are never, if possible, molested. These and other wild habits I can testify to be inherent in the race, and are well known to all who have an opportunity of acquainting themselves with them.

There is a plate of the "wild cattle of Chillingham Park," in the 425th Number of the Penny Magazine. This, when compared with the plate given of the same breed by Bailey and Culley in their account of Northumberland, shews that one or other must be a mere fiction of the pencil—an idol of the artist's brain. The Penny Magazine bull is a monstrous beast, got up for effect, and is as like the Chillingham breed, as it is like any other; as if the people were to be *pleased*, at all events, with something fine, although they should be *misinstructed*. The bull of Bailey and Culley is a handsome elegant-looking creature, with a straight back, smooth sleek skin, delicate limbs, a small head like the Ayrshire breed, and by no means curly and grizzly. When placed by the "Penny show" no one could recognise them as the same breed. The plate of the Hamilton cattle in the Naturalist's Library is peculiarly striking and graphic, and at the same time gives the shapes along with the character and habits of the animal.

From the principles attempted to be established in this paper, it is a matter of reasonable doubt whether there be any *original breed* of cattle in this island. One breed may be *older* or *purer* than another breed, but none of these can be pointed out as the primitive stock from which our present race of cattle sprung. That large breed of cattle known in this country by the names of the Holstein, Dutch, Holderness, Lincolnshire, Teeswater, or Short-horned breed, came originally from luxuriant meadows on the Continent, or rather in the north of Europe, and we may, from time to time, have received supplies from various quarters, of which the remembrance is now entirely lost. It is, however, well known that several varieties, if not species, of oxen, appear to have occupied the British island, in a wild state, at no very remote period. Lesley mentions herds of "*vaccæ non cicures*" which frequented the mountainous districts of Argyle and Ross. Dr Fleming supposes these were "probably the parent stock of our domesticated varieties, which, with but little care, are reared in the remoter districts." Cuvier, on the contrary, supposes that the fossil *crania*, found occasionally in marl pits, "resembling those of the common ox," may be regarded as the type of all our domestic cattle. Dr Knox doubts this on account of the *vast size* of the crania.

It would be in vain, therefore, to search among our present herds of cattle for an original breed, and even with the assistance of the science of Linné himself, the naturalist will find no small difficulty in fixing upon any living sort, now known, as the *origin* of our common breeds. From what is known of the Hamilton cattle, however, there can be no doubt that they are the *oldest* and *purest* breed now known in these islands. The history of a white sort of cattle may be traced as existing in this neighbourhood from time immemorial. They are mentioned as existing at Cumbernauld (about fifteen miles distant) through a series of ages; and as Cadzow and Cumbernauld once belonged to the Cummins, it is not difficult to explain how they are found in both places. The Hon. Admiral Fleming of Cumbernauld has no doubt but that the Hamilton breed and the Cumbernauld breed are identical; and as to their antiquity the universal voice of tradition is *as one.*

Black and white are probably the original colours of all our breeds,—red and brown are believed to be superinduced colours. The Hamilton cattle have only *two* colours, black and white. The cattle at Chillingham have three or four colours, white, black, red, and brown. The calves cast by the Hamilton breed when "off the markings" which is exceedingly rare, only shew black. This is not strange, since, *vice versa*, black animals often yield a *white* progeny. Dr Knox was very much astonished when Mr Black informed him that the West Highland cattle sometimes produce a *white calf.* What would the learned Doctor think of a *white* blackbird? *Albinos* are common enough among all sorts of animals, and there is sure nothing passing strange in a white cow having occasionally a black calf. The circumstance of the Hamilton cattle casting only *two* colours, I believe, is unparalleled, and cannot be affirmed of any other race now known.* The Chillingham cattle have always *three* colours, white, black, and brown; and they often cast brown and white colours. This shews that there is in them a dash of the "red and brown cow," and that they have been crossed at some time or other with an alien race. The breed, under these circumstances, cannot be considered as pure.

Dr Knox has also demonstrated from anatomical characters some of the peculiarities of the Hamilton breed. He says, "the forehead is broader, the nasal bones shorter, and the *turbinated bones differently constructed*." These and other less distinct peculiarities "are reproduced to a very considerable extent in the cranium of the common Galloway or hornless ox." Probably the Galloway breed is in some way akin to the Hamilton breed, or both may be from a common origin. The head of the Hamilton ox has a strange triangular appearance, whereas the head of the Chillingham ox is fine and tapers like the improved Ayrshire breed.

Dr Knox is of opinion that the Hamilton cattle are not *generically* distinct from the various breeds of oxen which now abound in this island. This is abundantly obvious; perhaps there is, strictly speaking, but one *genus* of oxen, and that all known species and varieties are of this one family. That the Hamilton cattle are an excellent, hardy, active, and durable species of stock, there can scarcely be a doubt. After seeing them chased for upwards of two hours, smoking like a compost, on visiting them next day, they were as fresh and active as if nothing had happened. The pasture on which they feed is, in the winter season, from its elevation above the level of the Clyde, very bleak and exposed. Yet in spite of these and other discouraging circumstances, the breed has *not degenerated*, as Lord Tankerville supposes, but, on the contrary, " has maintained its weight and good qualities under the most disadvantageous circumstances." Dr Knox has adduced the opinion of Mr. Plummer of Dalkeith on this subject, which is extremely important. His exceedingly judicious remark was, " the Hamilton breed of cattle, comparatively neglected, and supposed to breed as it were *in and in*, by being confined hitherto to a single stock, is yet *equal* in every respect to the *best* specimens of the west Highland breed, in the improvement of which so great and constant efforts have been made, both by individuals and by societies; the one receiving as it were the fostering care of a nation, the other protected merely by a single spirited nobleman."

---

* As the object of this paper seems to be the establishment of correct facts in regard to the ox, we may be here excused in stating that the short-horned breed of cattle cast only *two* colours, red and white, and none other. To shew the permanent character of these colours in that breed, the breed is believed by breeders to have originated on the banks of the Tees, and there first improved by crossing with the Holstein breed, which was brought over on purpose, and although the Holstein breed always sports black and white colours, the cross has permanently the red and white of the original Teeswater. In crossing the black Galloway with the Teeswater, the cross also retained the colour of the latter. If permanency of colours be a characteristic of a true breed of cattle, the original Teeswater must have been a true breed.—EDITOR

Dr Knox has got a pair of these oxen, on which he intends to institute a series of observations. There can scarcely be a doubt but that they will freely mix with other breeds of cattle, and produce a cross, perhaps a lasting one. A white cow was for some time kept by the principal keeper of Cadzow Park at Bothwell Haugh, which was milked, and was quite docile. It was afterwards turned out with the herd, and although considerably tamer than the rest, soon re-adopted its natural habits.

ON THE INCREASE OF PAUPERISM IN SCOTLAND.

Report on the Progress and Present State of Pauperism in Berwickshire; with Suggestions as to the Means of reducing its amount. By George Turnbull, Esq. of Abbey St Bathans, W. S. Edinburgh: Printed by Neill and Co. 1838.

There is no subject whatever which demands more attention on the part of the landed proprietors of Scotland than that of the poor, whether it is viewed as one more immediately affecting the proprietors themselves, or involving interests of the highest importance to the moral wellbeing of the community. The increase of pauperism in almost every quarter of the country, is an evil of too glaring a magnitude to escape the notice of every one; and hence we find in many parishes, the heritors and kirk-sessions have been attempting to stem the torrent, and arrest the evil. Notwithstanding these laudable endeavours, pauperism has continued to increase, until in some of the southern counties the burden entailed thereby upon the land already approaches the magnitude of the English poor-rates.

In Berwickshire the evil has been of long standing and of great extent, and the expense of supporting the poor has now arrived at such a height as to interfere very materially with the value of property in that county. The attention of the landlords has accordingly from time to time been directed to the subject, and the Report, the title of which we have placed at the head of this notice, is the production of one of them appointed to take the matter into consideration, and to report thereupon.

We learn from the introduction to the Report, that at the Michaelmas Head-Court of Berwickshire in 1836, the following resolution was adopted:—"That a committee be appointed to inquire into and report whether it is probable that the poor's rates of this county would be materially reduced by the erection of poor-houses, and if so, what measures ought to be adopted for that purpose; and, generally, to consider of the most economical manner of managing the paupers in the county." A committee was accordingly named, consisting of ten very influential individuals, Mr Turnbull, convener. This committee found that they could arrive at no satisfactory conclusion on the subject remitted to them, without obtaining correct information respecting the state of the poor from the different parishes in the county. Accordingly, after some steps unnecessary to notice, the committee adjusted schedules containing queries, and circulated the same among the clergy, with a request that they would fill up the information required. This request met with but little attention in the first instance, and a circular was again addressed to them, urging them to send answers before the county meeting in October 1837. This circular proved so far effective, that returns from eighteen parishes were received by the time fixed. These returns were received so shortly before the county meeting, that the committee had no time to make any report on the information they contained, and therefore simply notified the receipt of them to the meeting. It was also very desirable, before the committee should report on the subject, that returns should be obtained from the other parishes of the county. The meeting, however, became alarmed at the expense which might thus be incurred, and, accordingly, so far as the county was concerned, the business appears to have been wound up in the following resolution:—

"On 3d October 1837, the meeting remit to the committee to ascertain what it will be proper to pay to each individual having made these returns, and to report the same to the next General Meeting in April, which will then consider what it will be proper farther to do in this matter. In the mean time, the committee will proceed no farther with the inquiry."

It was evident, however, that the information contained in the returns already received, would be totally useless, unless some abstract or analysis of their contents was framed, and the conclusions and practical results to which they led made known. Mr Buchan of Kelloe accordingly suggested the propriety of having this accomplished, and requested Mr Turnbull to undertake the duty, and to lay the result of his labours before the county meeting in April. Mr Turnbull undertook to do so, and the Report now under consideration is the fruit of his investigations.

Mr Turnbull divides his report into three heads or sections, I. The Progress of Pauperism. II. The Present State of Pauperism; and, III. Practical Suggestions, with a view of counteracting the evil.

Under the first section, we are presented with an historical account of the progress of pauperism in the county. It appears from the documents there quoted, that the evil had from an early period (1694)* been of great magnitude in Berwickshire.

In 1705 the Sheriff and Justices of the Peace issued an order to the several parishes to provide for their own poor; and in some instances this was done, by the heritors and kirk-sessions, allowing the paupers badges, and permitting them to beg weekly within their parishes, and appointing the days of begging on each property according to its extent.[*]

---

* Records of the Parish of Fogo.

In 1725 the Sheriff and Justices issued an act "for the maintenance of the poor within the parishes to which they belong, and for the suppressing and punishing vagrant beggars."[†] It was this act which first introduced assessments for the poor into the county under the name of a "stent" for the poor, which was then, however, only imposed at irregular intervals, as occasion required.

We also learn, that, so early as 1754, an attempt was made in the parish of Dunse to retard the growth of pauperism by the establishment of a poor's-house. This house, after having been in existence for four years was abandoned, the number of paupers in the house being so much diminished (from 20 to 12) that it was found less expensive to maintain them otherwise, than to continue the establishment on their account.[‡]

Another attempt of a similar kind was also made in the parish of Eccles. At a very full meeting of heritors, where Lord Kames presided, much discussion arose respecting the management of the poor, and it was unanimously agreed, "That the heritors had been too indulgent in admitting upon the poor's roll people who could work more or less for their bread, and in allocating greater sums than necessary;" and as one mode of remedying these evils, "It was moved to the meeting, Whether the erection of a workhouse for three or four neighbouring parishes might not tend to lessen both the burden and number of the poor, in which view it was also recommended to the committee to talk to some men of interest and figure in the parishes of Greenlaw, Fogo, Swinton, and Coldstream, upon that subject, and if they agree, to consider next what may be a convenient plan for such a workhouse, the expense of building and providing it, the form of management, and other particulars that may be necessary."[§] This scheme was never, however, carried into execution.

Mr Turnbull goes on to state that the returns from the eighteen different parishes, establish the four following important facts.

1. The *numbers* of parochial poor have been increased by a

---

[*] Records of Fogo, 1705.

[†] Session Records of Dunse, March 21. 1725. [‡] Ibid. Feb. 3. 1758.

[§] Eccles Records, November 5. 1770.

constant progression since assessment was first introduced, till the present time.

2. Not only has the number of paupers been increased, but the amount of *aliment* given to them individually has been gradually augmented also, for the greater part of a century past.

3. From the increase in the number of the poor, and in the amount of the allowances, it follows, that the sums levied in the name of *poor's rates*, must have been augmented in a higher proportion than either; and,

4. The *church collections* (which form the legitimate fund for the relief of the poor) present no such progressions.

The second section of the Report, which treats of the present state of the pauperism in the county, is very shortly given; the results are, however, highly interesting; especially the view of the present state of pauperism in Berwickshire as compared with the rest of Scotland, and from which we extract the following passage:—

"It may be remarked, that the church collections, which amount to L.182 : 8 : 5, are equivalent to a payment of rather less than twopence farthing yearly by each individual in the population, and of this only a penny goes to the poor.

"The assessments are equal to a rate of 7¾d. per pound, or 3¼ per cent. on the estimated rental, and to a payment of 4s. yearly by each individual in the population. Adding collections at the churches, each individual contributes 4s. 1d. yearly to support the poor.

"In the year 1820 (the latest period to which the calculation has been made), the average number of the poor throughout Scotland, as compared

with the population, ascertained by the census 1811, was	1 in $40\frac{8}{10}$
In the unassessed parishes, it was	1 in $45\frac{4}{10}$
In the assessed parishes, ...	1 in $32\frac{7}{10}$
In Berwickshire, it is	1 in 26

"The expense of maintaining each pauper throughout Scotland was, in 1820, L.2 : 11 : 8¼ yearly, or about 1s. weekly. With us it is 1s. 10¼d., or nearly double.

"The average annual expense of maintaining the poor in Scotland generally, was found to be equivalent to a payment by each individual in

the country, of	1s. 3d.
In the unassessed parishes, of	0s. $8\frac{5}{12}$d.
In the assessed parishes, ...	2s. 3 • d.
In Berwickshire, it is	4s. 1d.

"In all these comparisons the county unfortunately appears to disadvantage."

The practical suggestions form, as has already been stated, the third section of Mr Turnbull's Report.

It will be observed, from the terms of the county resolution of 1836, that the subject of the poor was brought at that time under notice, in connection with a proposed inquiry as to whether the erection of poor's houses would have the effect of reducing the poor's rates of the county. Mr Turnbull was then the advocate for the adoption of that measure, and the above resolution, we are informed, was come to upon his suggestion. We were therefore prepared to expect, that the adoption of the poor's house system would be strongly recommended in the Report. Accordingly, after adverting to the alarming nature of the evil, and of the necessity of adopting measures without delay thoroughly to subdue it, he intimates, "The reporter is convinced that no means will prove effectual for this purpose, but the application of the poor-house system." "But he fears," it is added, "from what he has learned of the feeling of the public on the subject, that this system is one for which the county is not yet prepared; and therefore, in suggesting remedies, he will not confine himself to the subject of poor-houses only, but refer to whatever in his opinion may be useful in the circumstances of the case."

We sincerely trust that the feeling of the county may long continue as it is now constituted, and being perfectly satisfied that no necessity exists for the adoption of the poor's house system, we fervently hope that the day is yet distant when poor's houses will form a feature in the scenery of Scottish landscape.

In England, where poor's houses have long been part and parcel of the law of the land, it is difficult to treat of the subject without assuming the necessity of their existence. But when considered in connection with any country, where such erections in rural districts have been hitherto unknown, the utility of these receptacles may be fairly questioned; and in Scotland, in particular, where the law of the land, by which the management of the poor is regulated, is in the most essential particular different from the law of England, we are disposed to believe that the necessity for such erections will never take place, provided only the parties called upon to administer the law, take care to do so fearlessly and impartially. And we think the reasoning of Mr Turnbull himself, and the facts he mentions in his Report, and to which we will hereafter advert, fully carry us out in this position.

Mr Turnbull, while he fairly states his own opinion, that nothing but the adoption of the poor's house system can ever put an effectual stop to the growing evil of pauperism, yet, in deference to the opinion of others who may differ from him on this point, proceeds to detail various *other* expedients which may be adopted as means to counteract the evil. This part of the pamphlet is extremely well written, and points out the causes, both immediate and remote, of pauperism, with the means which should be employed to counteract them; and it deserves the serious perusal of every one who takes any share in the management of the poor.

The first and immediate cause of pauperism is *improvidence*. Improvidence itself has also its causes, differing in different individuals. In some it originates in ignorance of the great ultimate importance of prudence and forethought to their welfare and happiness. In others it may arise from intemperance; in others from a sheer love of idleness; but the most generally operating cause of this evil is the existence of the fund itself provided by the Legislature for its cure.

The remedies for the evil are then gone into a good deal in detail, and the following summary, as given at the conclusion of the Report, contains a condensed view of the means proposed.

"1. That the establishment of Savings Banks should be encouraged.

"2. That every applicant for relief should be required to answer, in writing, the necessary queries as to his place of settlement, destitution, &c.

"3. That every applicant should be required to assign his effects to the parish before he is enrolled as a pauper.

"4. That a list of the paupers, with their several allowances, should be printed and circulated periodically in the more populous parishes.

"5. That it should be established as a rule, that all applications for relief shall first be made to the kirk-session, for a supply out of the church collections.

"6. That a paid overseer should be appointed for several parishes.

"7. That poor-houses should be established.

"8. That the county magistrates should exercise the authority entrusted to them, of superintending the execution of the laws regarding the poor, by requiring annual returns from the several parishes, and appointing a committee on the subject."

These remedies, it will be observed, are of two kinds. The first, intended to operate upon the poor themselves, so as to remove from them the inclination or desire of being received as objects of charity, by encouraging providence in the management of their affairs, and raising the moral character of their condition by education. Of this kind is the proposed establishment and encouragement of Savings Banks, recommended in the first place. The second class of remedies are intended to operate as a check to the imposition of the poor, or, in other words, to prevent any obtaining relief from the fund unless really and legally entitled to receive such. And, as before indicated as our opinion, these, without the introduction of poor's houses, are sufficient to prevent the increase, and even to lessen the present amount of pauperism, in almost any rural district, providing only the heritors and kirk-session will firmly and fairly administer the law of the land on the subject.

We are aware that, in asserting the propriety of firmly enforcing the law as it at present stands on our statute book, we may be accused of inhumanity, and that especially by our southern neighbours, whose law has the appearance of being more mild and humane; but we feel satisfied that, upon calm consideration, the inhumanity will be found only to exist in appearance, and that, in reality, the law of Scotland is to the poor themselves the more humane of the two.

By the law of Scotland those who are entitled to permanent relief are "those aged, poor, impotent, and decayed persons, &c. quhilks of necessitie mon live by alms."* Lord Pitmilly in his work on poor's laws interprets the statute, as meaning those who "are disabled from procuring a living by their own labour, either by old age or some *permanent* bodily infirmity or mental incapacity, and who have neither separate means nor any relations who are bound and able to support them;"† and Mr Turnbull sums up by adding, "Hence no one is entitled to be enrolled as a permanent pauper who is not *disabled from making a livelihood by permanent inability*, nor any one, even if thus disabled, if he have *funds* of his own undisposed of, or *relations* bound and able to afford him the necessary relief,'—p. 24. We may add, that all our authorities agree in the justness of this interpretation of the statute. Such, then, only are the individuals who have a right to demand relief, and for whose relief heritors are bound to provide. The occasional poor have no legal right to demand relief, and however inhumane it may (as before remarked) at first sight appear, it is true, that no heritor can be compelled to administer to their relief, however necessitous their circumstances for the time being may be. Now, we have no hesitation in saying, that the frequent departure from this rule has been the great cause of the increase of pauperism in the county of Berwick; and our argument is, that before the heritors of that county make out a case for the necessity of poor's houses, and impose such a remedy upon the county, they are in justice and in mercy to the poor themselves bound to try what the effect will be of a more strict adherence to the law in their future dealings with these individuals.

---

* 1579, c. 74.

† Remarks on the Poor Laws, p. 24.—Lord Pitmilly's book is of great practical value, and no kirk-session ought to be without a copy of it, and every minister, heritor, and elder should make its perusal a matter of conscience.

We find from the minutes of the meeting of the parish of Eccles in 1770, at which Lord Kames presided, that it was unanimously agreed "the heritors had been too indulgent in admitting upon the poor's roll people who could work more or less for their bread," which proves, that even at that early period had the heritors begun to relax the good and wholesome law of the land—and in a subsequent part of Mr Turnbull's pamphlet we find ample attestation to the same fact. After adverting to the narrow limits which the claim of the poor for public relief is confirmed by law, he goes on to remark, "But in Berwickshire these limits have been largely transgressed. How many persons visited by mere temporary sickness or embarrassment have been relieved, not out of the church collections, nor by voluntary contributions, but out of the assessments? How many also have been so relieved who have relations able to support them? The striking fact has already been mentioned, that of 259 paupers, 121 have children above 21 years of age; and can it be imagined that none of all these children could afford the same amount of relief to their parents as they receive from the public? True, they have in most instances families of their own; but this is the mere consequence of their improvidence,—an improvidence occasioned by the very facility with which they found it practicable to turn over their parents to the parish for support. It has been mentioned, too, that of 177 paupers, 99 have declined to enter a poor-house; and that, rather than do so, these 99 are willing to forfeit their allowances. *Does not this prove that the larger portion of the county paupers are persons who could have subsisted without parochial aid, and ought, therefore, never to have been enrolled? All these persons, in short, have been successful in imposing on the managers of the poor.*"

Mr Turnbull no doubt puts his argument, that the poor's house is the only effectual means of guarding against the imposition of the poor; but in doing so he is assuming, that the heritors and kirk-session have themselves been guiltless of all mistaken leniency and misapplication of the law upon the subject; the reverse of this being at the same time abundantly evident from the facts above adverted to by Mr Turnbull himself.

Let it be known, not by word but by deed, that no individual who is able to work, that none who have relations able and bound to support them, can be admitted upon the poor's roll, and applications from those quarters will cease. And in cases of temporary sickness or want of employment, temporary relief will be found, if not from individuals, from the kirk-session; but with this difference, that the relief so afforded ceases with returning health, or the means of again procuring employment. We have already said that this system is a humane system, and a very few words in conclusion will serve, we trust, to demonstrate it to be so.

Whether is it more humane to encourage providence, industry, and frugality in the working population, by making known to them the necessity of laying up provision in the day of prosperity, against the hour of temporary sickness or want of employment; or to encourage improvidence and idleness, by assuring them of assistance whenever their own means of support fail? in short, by giving them a legal title to chaunt the ditty quoted by Mr Turnbull,

"Hang sorrow, drive away care,
The parish is bound to maintain us;"

is a question which we presume should be answered in the affirmative. Individual cases of hardship may be conceived to arise under the first member of this question, but looking at the subject in a philanthropical point of view, who can tell the amount of exertion, industry, and application which even the harshest feature of the Scottish poor's law may not have engendered—what independence of character, success in life, and substantial happiness, may not have been the result. On the other hand, it is easy to see the consequences of the opposite system; for the vice, and idleness, and consequent misery of thousands, can be traced too clearly to their dependence on parochial relief.

We might pursue this argument at great length, had our limits permitted. We cannot, however, resist the opportunity of strengthening our position by a quotation from the work of an individual, who, from no previous habits of training or education, can be suspected of even unconscious partiality for our system. Mr O'Flynn, Assistant Commissioner of Irish Poor Inquiry, in his pamphlet (p. 15) on the present state of the Irish poor, remarks, "It is impossible, for me at least, to offer any improvement on the present Scotch Poor Laws:—only the aged, the sick, and the infirm, derive any benefit from them; and the able-bodied labourer, though he may find it impossible to obtain work, has no claim for parochial relief. This, I think, is just as it should be, and is in reality a great blessing to the Scottish peasantry; they are in consequence trained up in notions of independence, as they are aware that they have themselves, and themselves alone, to look to for support; and the knowledge of this makes them prudent, industrious, and economical."

The machinery of the Scottish system, is, we cannot avoid remarking, admirably adapted to the end in view. The heritors and kirk-session jointly admit the claims of the paupers, and administer the funds:—the duty of administration being more generally performed by the kirk-session. We do not mean, in the most distant degree, to find fault with the manner in which the kirk-sessions generally perform this duty, when we say it would be better, were the heritors to give a more regular or personal attention to the state of the poor, and to the meetings at which their claims are considered,—much jealousy which often arises between the constituent parts of the administrative body might thus be avoided. For, instead of, as at present, the heritors looking into the state of the poor, and revising the roll, as it is called, at distant periods of time, which being so done, appearing as if done with the view of correcting the errors which the kirk-session may have committed—were the cases of the applicants for admission upon the roll investigated jointly by members of both bodies, the stated and necessary revisal of the poor's roll would give rise to no such feelings of fault-finding, as when the making up of the roll is solely the work of the kirk-session, and the revising only the work of the heritors.

We have refrained from entering into the discussion of many points of great importance connected with the subject of poor's laws, because we could not at present do so in a satisfactory manner within the short limits of this notice. The question of *assessments* is of itself of vital importance; the true nature of which is, we are afraid, much misunderstood;—certainly too often so in the manner of the application of the money. We may, however, at some future period, revert to the subject, there being assuredly none more entitled to a full and deliberate consideration. We think it clear, however, that, should assessments for the poor become general throughout Scotland, a new valuation of the whole property of the country must necessarily, in the first instance, be taken. At present the landlord may be assessed upon the valued rent, which had been valued perhaps 180 years ago; whilst the tenants of one estate may be paying their proportion upon their real rents, and whilst a proprietor of another estate of L.500 a-year, newly valued, may be paying a larger sum than his next neighbour with an estate of four times that value.

In conclusion, while differing with Mr Turnbull in his views regarding the necessity of the introduction of poor's houses, we feel quite justified in saying that his pamphlet is well worth the perusal and attentive consideration, not only of the proprietors in Berwickshire, but of the heritors and kirk-sessions of every parish of Scotland. He has in a very clear and able manner made use of the materials furnished him, and while we cannot but regret the returns had not been more general from the other parishes of the county, and trust the county will yet see the propriety of going on with the investigation, notwithstanding the *dreaded expense* of doing it, we feel satisfied that the data furnished by the eighteen returns with which Mr Turnbull had to deal, are quite sufficient to warrant the statistical results and comparative views of pauperism in Berwickshire, which he has deduced from them.

We have, in the preceding remarks, purposely avoided making any allusion to the working of the English Poor Laws under their recent modifications. In the midst of so much confliction of opinion, so much controversy, and we must add, so much heat, in the discussion of the question, it is difficult to arrive at any correct conclusion upon the subject. With our limited means of information, therefore, we must suspend our judgment in the mean time. The proposed introduction of the English system of poor's laws into Ireland furnishes at present grounds of deep and solemn reflection, and upon which we are still less prepared to hazard an opinion. We have read the late Lord Clements' work* upon the subject, and trust his Lordship's anticipations may prove correct in all the benefits to be derived from that measure. In the poverty, however, or, we ought rather to say, the utter state of destitution, in which masses of the peasantry of Ireland are sunk, during several months of every year, we own that we think it will puzzle any body of poor-law guardians to form a dietary for the poor's house, on so low and meagre a scale as to prevent the inducement for crowds of able-bodied paupers flocking into, and remaining its inmates for an indefinite period. Whatever may be the result, the introduction at once of a poor's law, complete in all its details, into Ireland, is a moral experiment, of a magnitude never before exhibited in the history of mankind. We shall anxiously watch the progress of its working, and fervently hope it will tend to the quietude of that distracted portion of the empire.

AGRICULTURAL CHEMISTRY, NO. IV.

By Henry R. Madden, Esq. L.R.C.S. Edinburgh.

We have now to commence the most important, but at the same time by far the most difficult, branch of our subject; namely the *Philosophy of Manure*, or the scientific principles upon which the cultivation of plants is founded. To accomplish this, with facility and perspicuity, it will be necessary to divide the subject into the following heads.

---

* The present poverty of Ireland, convertible into the means of its improvement under a well-administered poor-law. By Lord Clements, M. P. London. Knight & Co., Ludgate Hill, 1838.

I. To give a clear view of the objects to be attained by the application of manure.

II. An account of the composition, and respective value, of some of the more important manures.

III. An account of the circumstances which should guide us in the choice of manure, and its application to various crops.

IV. The economy of manure, or the methods to be adopted in order to produce manure as quickly as possible, and likewise to apply it to the greatest advantage.

I. There is no point connected with agriculture, in reference to which more incomprehensible statements have been laid before the public, than those which have from time to time, and more especially lately, been published upon the subject of manure; and it appears to me that these could never have been conceived, far less made public, had due attention been given to that branch of the subject, to which the present section is devoted, namely, the objects to be attained by the application of manure: these we shall now consider. We have already shewn that by far the most essential point to be attended to in the cultivation of plants is to present to them a constant supply of organic matter, in a state capable of being rendered soluble in water; and we have moreover seen that this is accomplished, by adding to the soil, at certain intervals, various refuse matters, which are technically denominated *manure*, by which means all kinds of *dead* organic matter, are re-converted into *living* organized bodies; and consequently the objects of manuring may be described to be, the conversion of refuse matters into useful food; or in other words the duty and object of the farmer, is to *convert manure into crops*. This fact, however, appears to have been most determinedly overlooked by many late writers upon the subject, and in consequence there has been more nonsense and absurdity published in reference to this point, than one could have possibly imagined. Thus, for example we are most seriously told by a late writer upon fluid manure, that " there are many plants which by distillation yield a strong *spirit*, which is so powerful a manure, that, from some experiments he has *himself* performed, he confidently looks forward to the time when the *manure* for an *acre of land* shall be contained in a *quart bottle*." This statement is really almost too absurd to refute, were it not that the opinion appears to be gaining ground in some parts of England. I trust therefore that my more enlightened readers will excuse me for occupying some space in proving the impossibility of such a thing being accomplished. It must be evident to all, who will take the trouble to think of the subject, that the weight of the crop must always bear some proportion to the weight of the organic matter in the soil; for, of what do vegetables consist?—Of *water*, *organic matter*, and *earthy particles*. Now the first and last of these are supplied by the soil itself (considered as a *mineral* substance) but the organized portions can be supplied to the plant only by organic matter, previously existing in the soil; for although plants do obtain some of their *carbon* from the air, still this is but an inconsiderable portion, and moreover much of the *carbonic acid* which yields that portion, has been supplied by the previous decomposition of organic matter. We may therefore infer, that should the above-mentioned author succeed in manuring an acre of land with the *contents of a quart bottle*, he will in time discover that the same article will be almost sufficient to contain his crop. But the believers of the above doctrine may say that the author has proved it by direct experiment, and consequently he must be either willingly deceiving the public, or must have some grounds for his statement. Now I have no doubt that the author is perfectly satisfied in his own mind that he is writing the truth, and I shall endeavour to shew how he has been misled. His *powerful spirit*, was of course applied to *soil*, (probably very rich garden mould) and the result was that it had a most powerful effect upon the vegetation of that soil, and in fact its influence was felt by "many succeeding crops:" but this by no means proves that his spirit is really a manure at all; it may act only as a *chemical* agent in producing the more rapid decomposition of the vegetable fibre of the soil, and thus rendering it soluble; and consequently his crops were produced by the *original organic* *matter* of the soil, and not by his *powerful spirit.* For had he continued its application from time to time, and taken care to prevent any subsequent addition of fresh organic matter, he would have undoubtedly found that his soil became exhausted. Let any one who doubts this statement, take soil free from all organic matter whatever; for example, let him mix artificially chemically pure sand, clay, and chalk in the same proportions as they exist in the best soils; let him sow his seed, and then apply this *powerful spirit*, and observe the results; let him weigh the products, and then he will, beyond doubt, see the truth of the fact, that the weight of the crop is proportional to the weight of organic matter in the soil. If the object of a farmer was merely to obtain good crops for a few years, and afterwards to allow the land to lie waste and useless, then, indeed, some powerful stimulus, such as the spirit in question, would be of great value; but, what farmer, I ask, would so wilfully injure his own interest, by thus exhausting his soil, for the sake of procuring one or two good crops? Some persons, however, may remark, that it would be extremely difficult to prove the relation between the organic matter in the soil and the crop; for example, they might quote the case of turnips, where, in a good crop, two or more tons are produced, by a space of ground, upon which not more than one ton of farm-yard manure has been spread; and nevertheless there is sufficient nourishment left for several crops afterwards without any addition. I shall therefore shew the manner in which this relation is to be discovered, or at least point out some circumstances, which are liable to be overlooked, but which are of the utmost importance in any investigation of the kind. In the first place the real weight of dry organic matter in a crop is extremely small in comparison to the weight of the crop itself; for instance 25 tons of globe turnips are calculated to contain only two tons of solid matter, of which a part of course is saline. Hence in that turnip there is not 8 per cent of organic matter. The grain crops of course contain a far greater quantity, but even in them more than one-fifth is composed of water and saline substances. Secondly, the quantity of organic matter in soil is very liable to be underrated, as will be shewn by the following calculation. According to the analysis of Sir Humphrey Davy and others, good soil contains about 11 per cent at least of dry organic matter; now, taking nine inches as the depth of such a soil (which is by no means great), it will be found by calculation that one imperial acre will contain no less than 91 tons of dry organic matter, and hence, were the whole capable of being converted into turnips without loss, each acre of good soil would (theoretically at least) be capable of producing upwards of 1200 tons of globe turnips before the land would be completely exhausted! A careful examination of these facts cannot fail to shew to all, the fallacy of judging of the power of a manure by its effects when mixed with *soil.* Of course I do not mean by this to dispute the value of experiments with different kinds of manure on various crops; but merely have endeavoured to shew that, when authors attempt to talk about concentrating manure to such an extent, that the contents of a *quart bottle* will supply nourishment to the crop upon *an acre of land*, they should, in the first place, prove whether their substance is really a manure, or merely a chemical agent; and certainly ought not to give publicity to any opinions performed in a manner so replete with fallacies. The following fact alone should be sufficient to silence at once all such idle propositions. We have every reason to believe that "*creation* has long since ceased and *conversion* alone continues to take place," or in other words, "*new matter* is never now produced, but merely *matter already existing*' is constantly *changing its form.*" Much more might be said with reference to this point, but we have subjects of far greater importance to engage our attention, than the refuting of such visionary speculations. To recapitulate, therefore, the objects to be attained by the application of manure may be stated to be, the preservation of a certain degree of richness in the soil, in order that the seed sown may be furnished during all the stages of its growth, with a constant supply of organic matter, in such a form as to be capable of being absorbed; and moreover this organized matter being supplied by otherwise useless, and in fact injurious, substances, one of the national advantages of manuring land may be said to consist in the conversion of noxious matters into useful and wholesome food.

II. In giving a general account of the composition and respective value of the more important manures, we must remember that there are many collateral circumstances to be taken into consideration, which, although they may be of no importance theoretically, are nevertheless of such great practical consequence, that, without due attention to them, no scientific account of manure can be of any value to the farmer. *Manures* are generally divided into *organic* and *inorganic or mineral.* Professor Low, in his excellent work on practical agriculture, adds an intermediate division of *mixed manures,* which will aid greatly the consideration of this extensive class of substances. Properly speaking, the organic and mixed are the only true manures, the purely mineral ones acting either as *chemical* aids by promoting putrefaction; as *mechanical* agents by altering the texture of the soil; or probably also as *stimulants,* by acting directly upon the roots of the plants themselves.

1. *Organic manures.* By adding organic matter to the soil, we are of course supplying plants with all that they require for their nourishment; nevertheless it is not sufficient that this organic matter should exist in the soil, it must be in such a state as to be capable of being absorbed by the roots of the plants; for which purpose we have already seen that its elements must be in that peculiar state of combination which has received the name of *humin;* or, to express it otherwise, in such a form as to be rendered soluble in water when exposed to the action of the spongioles. From this fact we may make several generalizations with reference to the respective value of different kinds of organic manure. Thus, *scientifically* speaking, a manure may be said to be valuable in direct proportion to the quantity of pure organic matter it contains, its tendency to decomposition, and its facility of being rendered soluble by this, and other changes which take place in it: *practically,* however, a manure may be said to be valuable in direct proportion to the length of time during which its influence is felt by the crops on the land to which it is applied; as also to its portability, to the facility with which it can be

incorporated with the soil, and, *last not least*, to its cheapness, and the readiness with which it can be procured. Hence the most useful manure would be one which combined these several advantages, namely, one which was cheaply produced, easily carried, readily mingled with the soil, and when there, keeping up, by its gradual decomposition, a steady supply of *humin*, or other soluble organic matter. To discover such a manure, or, still better, to ascertain some method of imparting such properties to the manures in common use, would be one of the most valuable acquisitions to modern husbandry. That *chemistry* may in time be capable of doing this, there is little reason to doubt, all that seems necessary, being, that some person properly qualified should earnestly devote himself to the task. In the following remarks upon the nature and composition of the different species of manure, particular attention will be paid to these qualifications. For the sake of perspicuity I shall subdivide that class of organic manures into the *purely vegetable*, the *purely animal*, and the *vegeto-animal*.

(1.) The *purely vegetable manures* are, green plants, rapecake, malt-dust, the steepings of the flax and hemp, straw, woody fibre, tanners' spent bark, &c.

Green plants are constantly used as manure, and are very useful for that purpose; they are seldom collected expressly, but are made use of on the spot where they grow; as examples of this, we may mention the ploughing in of grass, and the ploughing and hoeing of weeds during fallow and green crops. This manure consists chiefly of saccharine and mucilaginous matters mixed with ligneous fibre; and it consequently will be observed that it requires no preparation whatever; that it contains organic matter already in a soluble state, namely the sugar and gum, and the ligneous fibre itself is so moist and so completely impregnated with vegetable juices, that fermentation rapidly commences, and consequently a supply of soluble matter will be kept up until the whole is consumed. Care must be taken, however, in ploughing in green crops for manure, not to make too deep a furrow, especially on strong lands; as in that case the quantity of soil which covers the vegetable matter is so thick that it diminishes the action of the air, &c., upon it; and it is a well ascertained fact, that fermentation is retarded, if not altogether prevented, by compression and the exclusion of air. The best period for ploughing in green crops (provided other circumstances permit of it) is undoubtedly when the plants are in flower, as at this period they contain the greatest quantity of sugar and mucilaginous matter; and, moreover, in the instance of weeds, it prevents the possibility of their propagating their species by the scattering of their seed. The importance of allowing this species of manure to ferment in the ground, instead of in a heap, is, that (in addition to the great saving of labour) the slowness with which the decomposition takes place, is supposed to tend to produce much more soluble matter and less gas than when it proceeds above ground. The parings at hedge roots, scourings of ditches, pond-weeds, &c., may be used in this manner.

Rape-Cake has been used with great success as a manure; this, like the preceding, contains a large quantity of vegetable matter, already in a state capable of being dissolved in water, its composition being mucilage, a large quantity of vegetable albumen, a little oil, and woody fibre. It has the advantage over the former of being much drier, and hence containing far more manure in the same bulk of material; but, on the other hand, it is by no means so easily procured, and is much more costly. It is chiefly used in fallow, before wheat, and should be sown *fresh*; and before its application should be kept as dry as possible, as moisture readily causes fermentation to commence, which, when once set in, will undoubtedly proceed with rapidity, unless the substance is carefully dried. And here we may make the general remark, that all substances which contain much fluid, and more especially such as are composed of mucilage, sugar, and other soluble matters, should be used when perfectly fresh.

Malt-Dust is mentioned by Sir Humphrey Davy as a good manure, on account of the quantity of sugar it contains. I have not, however, been enabled to meet with any particular account of its application; of course, if used, it should be allowed to ferment in the soil. The washings and other refuse of distilleries, I am informed, are much used in some parts of Ireland, as an application to grass lands, and their effects are stated to be very powerful. This, of course, will depend upon all the vegetable matter which it contains being soluble, and therefore very probably absorbed at once, without undergoing any decomposition whatever.

The next manure we shall mention, is one which can be applicable in a few cases only, on account of the local nature of its production; we refer to the *Water in which flax and hemp have been steeped.* It is well known that flax and hemp consist of the woody fibres of these plants, and that one of the first steps in their manufacture is the steeping of the plants in water, in order that the softer tissues may ferment, and the ligneous fibre be thus freed from the useless parts of the vegetable: of course, therefore, the water in which these plants have been steeped, becomes fully charged with *soluble* and putrescent vegetable matter, and consequently acts powerfully as a manure, and moreover requires no preparation whatever, as fermentation has already commenced. It is not necessary, however, to dwell much upon this subject, as its use must, of course, be confined to those districts where flax and hemp are cultivated.

Sea-weeds. All sea-shore plants, especially those which grow below highwater mark, and which belong to the natural families of *Algæ* and *Fuci*, &c., contain more or less *mineral alkali (carbonate of soda)*, and have long been used as manure by the farmers in the neighbourhood of the sea. They are, however, so succulent and mucilaginous that their effects are by no means lasting; even when placed in heaps and allowed to ferment, they produce but very little heat; in fact, appear rather to dissolve away. They consist chiefly of water, mucilage, a small quantity of woody fibre, and saline matter; according to the analysis of Sir Humphrey Davy, nearly four-fifths was water, which contained no *ammonia*, and consequently the plants possess no *azote*. When applied to land, their effects are felt almost immediately, as the mucilage dissolves as soon as the outer covering of the plants is destroyed by fermentation; but from its soluble nature, its effects are but slight, and after the first year, are no longer perceptible. The alkali they contain must also act as a chemical solvent, which will hasten their consumption. It has been proposed, (see vol. iii. of this Journal, 1831–2), to collect the sea-ware, and dry it by spreading it like hay, by which means, of course, nothing but water will be lost, and at the same time, the bulk will be reduced to one-fifth, in which state the author considers it to be a very valuable manure, and calculates that it can be procured and carted off at half the price of straw. This suggestion, I think, might probably be useful in some of the farming districts which are situated near the sea, but still not close enough to use the ware in its fresh state, as undoubtedly the manure is a good one as long as it lasts. The drying, also, will prevent the decomposition from taking place so rapidly as if applied when fresh.

Dry Straw of wheat, barley, and other grain crops, and spoiled hay, are always useful manures. Sir Humphrey Davy, in speaking of these, adheres to the opinion which pervades the whole of his work upon Agricultural Chemistry, namely, that they should be applied fresh, and that if allowed to ferment, a large quantity of nutritious matter is lost. As this is a point more severely criticised than any other statement which his work contains, and as, moreover, it is one of extreme importance, I shall here enter fully into the subject, and endeavour to reconcile, if possible, the exceedingly discordant opinions which are entertained regarding it. To proceed, let us state the question. *Theorists* say, all manures should be applied to the soil as fresh as possible, because, during the process of fermentation, if allowed to proceed above ground, much valuable matter is lost which would otherwise have been available to the crops. *Practical farmers*, on the contrary, maintain, that experience has proved to them, that, unless the manure is fermented to a certain degree before it is applied, it is not of half the value; in fact, in many instances it greatly endangers the success of the crop. How, therefore, can these be reconciled? On careful examination we shall see, that here, as elsewhere, all the difficulties will vanish when *theory and practice* are brought jointly to bear upon the subject, in such a manner that the one shall correct the other; or, in other words, when the question at issue is compromised, so as to suit the purposes of the *farmer*, and at the same time, not contradict the statements of the *philoso-*

pher. In the first place, we may take it for granted, that in all cases where *theory* is opposed to *successful practice*, the former will eventually be found to be at fault, for it is perfectly evident that the knowledge of the true theory must improve, instead of opposing those practices which time has shewn to be the most successful. Nevertheless, in the case before us, there is nothing *radically* wrong in the theory, but it has evidently been carried too far; in fact, it has been worked out, (if we may use the expression), as a chemical problem, without due attention having been paid to the end in view; namely, the rendering of assistance to the farmer in his all-important operations. There is no doubt, for instance, that *carbonic acid* and *aqueous vapour*, are given out in abundance during fermentation, and also in the case of animal manures, *carbonate* and *hydrosulphate of ammonia*, all of which are in certain cases of great importance to plants. But it is not sufficient to prove a fact scientifically, and at once apply it to practice, for, unfortunately, such is the imperfect state of science at present, that there is scarcely a single instance where some modification is not required, when the two are brought to bear upon each other. For example, in the case in question, it is not sufficient to discover that some of the value of the manure is lost during fermentation, and in consequence, to argue at once that manure should be applied fresh; we must prove in addition, that by so doing the farmer will not injure his interests in any other way; that, when so applied, it will serve all his purposes as well as when previously fermented. This, however, we shall not be able to do, for the following reasons. What the farmer wants when he applies manure to his land, is, 1, to enrich the land in such a manner that it shall be immediately fitted for cropping, and hence, a part of his manure must be *already* prepared for use, namely, rendered *soluble*. 2, The substance applied, must be in such a condition as to be easily incorporated with the soil, by the subsequent operation of tillage; and consequently must be in such a mechanical state, as not to interfere with these operations. Now, it has been proved scientifically, first, that when vegetable matter, and still more so, when a mixture of animal and vegetable matters, are exposed in a heap to the joint action of air and moisture, the temperature soon rises; chemical changes take place; part of the *oxygen*, *hydrogen* and *carbon*, go off in the form of *aqueous vapour*, and *carbonic acid;* and at the same time a part of the remainder is rendered soluble, either in the form of *humin* or some such combination; but, secondly, it has been proved that when these materials, instead of being heaped up, are spread out, and mixed with mineral matter, as when ploughed into the soil, the changes take place much more slowly; and lastly, it has been *conjectured*, but by no means proved, that when those changes take place in the soil, more soluble matter, and less gas, is formed, and consequently that the effects upon vegetables are more powerful. Let us compare notes: The first object of the farmer is to have a supply of nourishment in a state fit for immediate use; but this can only be obtained by fermentation; and in the soil fermentation takes place very slowly; consequently, when fresh manure is applied, the seeds run a chance of having to wait for their food: and, moreover, it is a generally acknowledged fact, with reference to all chemical changes which masses of matter undergo, that these changes proceed much more rapidly after they are once fairly commenced, than in the first instance. Again, fermentation softens and breaks down long straws, &c., which would otherwise make the husbandry extremely foul. This objection, in fact, presented itself to Sir Humphrey Davy, and to obviate it, he proposes the straw to be chopped before it is spread. The proper question for discussion, therefore, is not merely, as we have seen, whether fermentation is accompanied with loss; but whether the extra advantages attending the use of previously fermented dung will compensate for the loss sustained during its preparation. All practical farmers will doubtless answer in the affirmative; but even here we must be cautious how we generalize the principle. Practical men are at all times too fond of making general rules; for example, in the case before us, most farmers ferment their dung to a certain extent, *often much too far*, and then apply it to all purposes indiscriminately, whereas it is clear that the necessity of fermentation holds good only in those cases where an immediate supply of nutriment is required; and consequently, when a fallow is manured, or when the manure is ploughed in with the stubble in autumn, in preparation for the next year's green crop, the manure may be used in a much fresher state, especially on strong soils. This fact has been well illustrated in a paper, on " A new method of applying Manure," by Mr Baker of Nassau Cottage, near Leeds, which appeared in the 6th volume of this journal in 1836–7. The same plan is likewise mentioned in British Husbandry, in the Library of Useful Knowledge, under the article Manure, where it recommends the fresh manure to be laid on the stubble during winter, and the long-straws raked off before the spring ploughing. It has been remarked, however, that the practice of ploughing-in raw manure in autumn, as preparative for the next year's crop, will not answer on light soils, as in this case a large quantity of the manure is lost; in fact I have been informed by an excellent authority upon such subjects, that nearly double the quantity in such soil is required to produce the same effect when applied in this way, as when fermented above ground, and ploughed-in immediately before the spring sowing. This I presume must depend upon the open texture of such soil, by permitting rapid fermentation and allowing the gaseous parts to escape, and likewise the soluble matters to be washed deep into the soil as soon as they are produced. Thus we at once see how to compromise the question, and we consequently leave it in the following position, namely, that undoubtedly loss of manure is sustained by allowing fermentation to take place before it is applied to the land; but that this loss is more than compensated for, by the peculiar advantages of fermented dung in all cases where an immediate supply of nourishment is required. But on the other hand, that in those cases where the manure is to remain some months in the soil before the seed is sown, it should unquestionably be applied in a much fresher state, although even in this instance incipient fermentation may be useful, by rendering it capable of being kept up with greater facility, under the disadvantageous circumstances in which the manure is placed, when mixed with soil. I do not, however, by any means wish it to be supposed, that I consider the question as settled, far from it; the above statement is merely a representation of the case as it at present stands; but obviously a great deal has yet to be learned, more especially with regard to the *science* of the subject. We must return, however, to the consideration of the individual manures.

Mere Woody Fibre. At first sight one would be inclined to ask, When is mere woody fibre ever employed as a manure? But if we consider a little, we shall find two substances at least, which have been proposedas manures, to consist chiefly if not solely of this chemical compound,—I refer to the refuse of the *tan-pit*, and *peat*. Both of these contain little or no substance besides mere woody fibre; for example, the operations of the tanner have removed all the soluble matter from the bark which he employs in his manufacture; and the long continued action of water has had the same effect upon peat. When we remember that the prime object of manuring, is to supply the plant with organic matter in such a state as to be capable of being dissolved in water, we must at once perceive that, theoretically, this manure is one of the worst possible kinds, if used in an unaltered condition, and practice has long ago proved the same fact; for Mr Arthur Young, in his valuable "*Essay on Manure*," states, that "spent bark seems rather to injure than assist vegetation;" and it is well known that no plant can grow in soil where there is an accumulation of peaty matter. Mr Young supposed that the injurious nature of tanners' spent bark depended upon the astringent matter that it contained; but Sir Humphrey Davy has shewn, that the processes to which the bark is subjected, free it entirely from soluble matter, and that the injurious action most probably depends upon the bark having a great attraction for fluids, and at the same time being impervious to the roots of vegetables. On this account, therefore, the bark would absorb the soluble parts of the manure, and thus deprive the plants of their food as soon as it was prepared for them. Even Sir Humphrey Davy, therefore, allows that *mere woody fibre* requires to be fermented before being used as manure; since, from the absence of all mucilaginous, saccharine, and other soluble matters, there is little or no tendency to decomposition, and consequently this must be brought about artificially; the best mode of doing which, is either to mix it with a quantity of hot lime, or to follow the plan proposed by Lord Meadowbank, of mixing it with farm-yard manure. The success of this latter method being dependent upon the fact, that if putrefaction commences at one point of a heap of organic matter, it will undoubtedly spread through the whole mass. In reference to the action of lime upon peat, &c., we shall say nothing at present, as this will be fully treated of when we consider the mixed manures.

(2.) *Animal Manures.* It is generally allowed that these require far less preparation, than those derived from the vegetable kingdom, since they have a much greater tendency to putrefy, and hence of course do not require to be heaped together in order to produce this effect; besides their mechanical form is seldom such as to interfere materially with the various operations of tillage. They are comparatively seldom used alone, but nevertheless require consideration here, in order that the subsequent remarks upon the *vegeto-animal* composts may be more fully understood. The chief of them are—the various kinds of excrement, urine, hair, woollen rags, feathers, dead animals, fish, blubber, and horn.*

Of the various kinds of *excrement, night-soil* is by far the most valuable. This substance has been long used by the Chinese, who mix it with one-third of its weight of marl, and dry it in cakes by exposure to the sun. These cakes are said to be void of all disagreeable smell. It is likewise prepared with quick-lime in France, and sold in the form of a dry powder, under the name of "*poudrette*," in which state it is sown with the seed in the same manner as rape-cake; the admixture of lime is merely to prevent the disagreeable odour which this substance otherwise possesses. There exist many prejudices against the use of this truly valuable manure, but it is needless to say that these are entirely without foundation.† The other species of excrement which have been used as manure, are those produced by the various birds and animals which are kept in a domesticated state. These have been found to be of very different degrees of power; the most valuable is supposed to be that of the *pigeon:* this, however, can only be used where great numbers of these birds are kept. It is stated to contain 23 per cent of soluble matter when recent, and hence will require no preparation before it is used. The next in order is the cleaning of *poultry houses;* this is very similar to the last, and of course is produced in much greater quantity. A good method of using these manures, would probably be, to form them into compost with earth, dry leaves, &c.; thus imitating the process which goes on in woods frequented by the wild pigeon, where the soil is found to be peculiarly rich and valuable. Of the excrementitious matters produced by the various domesticated animals, that of the *rabbit* is stated to be the most valuable; but of course it is liable to the same objections as those above mentioned, namely, the small quantity in which it is generally procured. Some farmers, however, have gone so far as to say, that it is profitable to keep rabbits for the sake of their manure; this, however, must be under very peculiar circumstances. Of the remaining manures of this order, that of the *sheep*, *horse*, and *swine*, are generally considered more powerful than that produced by *cows*. It is needless, however, to enter fully into the consideration of all these, as the whole of them act in pretty nearly the same manner, only with slight differences in their power. The composition of all this class of substances is the debris of the food taken by the animals, mixed up with bile and various other matters.

---

* *Bones* are often enumerated among animal manures, and their origin would certainly justify such an arrangement, but from the large proportion of earthy and saline matter they contain, they will be more conveniently treated of under the head of mixed manures.

† Animalized carbon appears to owe its fertilizing powers to this substance.

Urines. These are all very powerful manures, but it is curious enough that, with one exception, they are all improved by putrefaction. The best way of using them undoubtedly is, to have the stables, &c. so constructed that all the fluid parts are carried into underground tanks, where they accumulate, and can either be raised by a pump and applied in the liquid form, or, which is probably the better plan when circumstances will permit of it, the tanks may be filled with porous earth, and the whole will then form an exceedingly rich compost: probably peat might be advantageously used for this purpose. In whatever way, however, this manure is applied, it is at all times most valuable. It abounds in *ammoniacal salts*, which have been supposed to be the cause of their injurious action when fresh, as it has been proved that solutions of these salts, unless extremely dilute, act injuriously upon plants; this, however, can hardly be the cause, as putrefaction increases instead of diminishing the quantity of ammonia. The one exception which I mentioned is the urine of the *sheep*, which is stated by all practical farmers to act as manure as soon as it is formed. Now, it is not easy to understand how this should differ from all other kinds of urine; but with the testimony of all farmers in its favour, it would certainly be worth while to have the point carefully examined into, before we endeavour to explain it.

Hair, *Woollen Rags*, *Feathers*, *&c.*, are all valuable manures, when they can be procured in sufficient quantity. All woollen rags are carefully collected by the inhabitants of the South of France, for the purpose of burying them at the foot of their olive-trees. Their composition appear to be chiefly gelatine and albumen. They decompose much more slowly than the generality of animal manures, and, consequently, will probably be found peculiarly useful in those cases where a supply of *nitrogen* is required during the latter part of the growth of a crop, as for example in wheat. This subject I shall revert to when speaking of the application of manure to various crops. In the manufacturing districts the refuse of the different woollen factories will be extremely useful in this respect.

Dead Animals and Fish. The former of these are very seldom used by the farmer, although it is evident that they would be extremely useful. Sir Humphrey Davy very properly proposes, that animals which die from disease or accident should (after having the skin removed) be covered with five or six times their bulk of soil mixed with lime, and allowed to decompose for some months, when the whole will be found to constitute a rich compost; the disagreeable smell of which may be prevented, by mixing lime with it when about to be turned. The refuse of slaughter-houses might be advantageously employed in this manner. Dead fish have been long known as a very powerful manure; they of course, however, are liable to the objection already stated, namely, the difficulty with which they are procured, except in certain situations. When employed, they must be mixed with soil and applied fresh, care being taken not to use too great a quantity, as they are very liable to produce rankness in the crop; their effects are felt for many years. The refuse of the fishmarkets, and that of fishing-villages, ought on this account to be carefully collected, and made into compost. *Guano,* a most valuable manure, which occurs in the South Sea Islands, in beds of from fifty to sixty feet thick, has been analyzed by Fourcroy and Vauquelin, and found to have a composition similar to the dung of sea-birds. This will account for its value, as in that case it will consist chiefly of the debris of fishes, mixed up with the ordinary constituents of the dung of birds.

Blubber and Horn are both very useful manures, when they can be procured; they both are composed almost entirely of animal substances, capable of being rendered soluble in water during putrefaction, and are at the same time in such a state that decomposition goes on slowly. We now come to the consideration of by far the most important of all species of manure, namely,

(3.) The *Vegeto-Animal* manures, or those which contain a mixture of animal and vegetable substances. These are chiefly the different varieties of stable-manure, &c. which are known under the name of "*farm-yard dung.*" This, from its abundant production, and many other causes, is beyond doubt by far the most valuable manure at present known. For example, it is valuable in a scientific point of view, because, being a mixture of animal and vegetable matter, it ferments easily, supplies a large quantity of soluble matter, and from its nature is capable of yielding nourishment to *all* kinds of vegetables. And practically, this manure recommends itself to the farmer,—1, Because it is necessarily produced in considerable quantities upon all farms where stock is kept; 2, Because, from this circumstance, it is evident that none of the crops consumed on the farm can be considered as lost; and 3, Because experience has long ago shewn that no manure is so generally useful.

It is needless to attempt to state the composition of a substance which must be of necessity so various; a few practical remarks will be, therefore, all that I shall introduce here. In the first place, it will be evident to all that the value of this manure will differ greatly according to the relative importance of its different ingredients; as, of course, since animal matters produce the greatest quantity of soluble nourishment, the greater the proportion of this class of substances the more useful will the compound prove. Again, it has been shewn that the period at which it is applied influences greatly its beneficial effects; for if allowed to rot away until it is reduced to the state of a *soft, dark, unctuous mass*, not retaining any remains of vegetable structure, it can be easily shewn that more than one-half of its most valuable constituents have been lost. The remarks, however, which we have already made upon this subject of fermentation will, of course, apply here. It is stated in the Library of Useful Knowledge, in the article on British Husbandry, that the manure of fat beasts is much more valuable than that of lean cattle: this will very probably be the case, and, of course, depends upon the food with which the animals have been supplied. Thus, ten carts of dung from animals fed with oil-cake, were found equal to sixteen from those fed upon turnips. From this fact, therefore, it would appear necessary, that, in experimenting with this manure, we should pay attention to the food with which the animals have been supplied during its production. Much more might be said regarding the formation and management of dung-heaps; but this would involve us too much in pure practical farming.

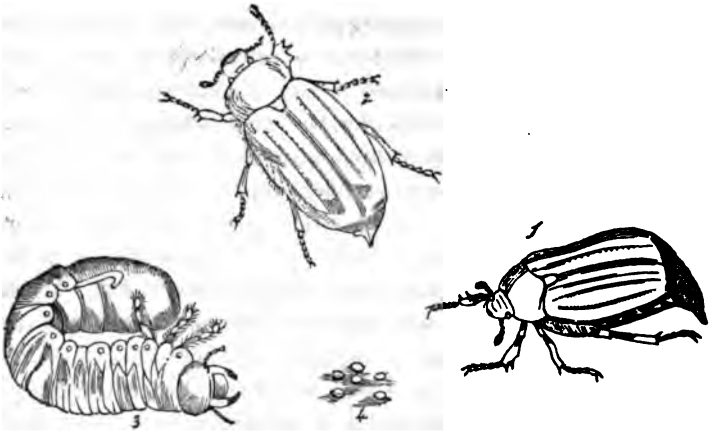
We shall next treat of mineral manures, &c.

ON INSECTS MOST INJURIOUS TO VEGETABLES AND ANIMALS, AND THE MEANS BEST CALCULATED TO COUNTERACT THEIR RAVAGES. NO. V.

By James Duncan, M. W. S.

Lamellicorn Beetles or Chafers.—A tribe of coleopterous insects is known by the above name, which refers to the structure of the antennæ. These organs terminate, as is frequently the case in other instances, in a club, but in them the joints composing the club are produced laterally into thin lamellæ or plates, sometimes of considerable length. This peculiarity is most conspicuous in the male, the lamellate structure being usually very rudimentary in the other sex. The legs are what is termed fossorial, that is, formed for digging, and the tibiæ are dentate or spinous on their outer edge. Considered in its fullest latitude, this group is of great extent, and comprehends among its exotic species, some of the largest and most remarkable forms in the whole range of entomology. This singularity of aspect is frequently produced by large horns on the head and thorax, or the unusual elongation of the mandibles. Of the latter peculiarity we have a good example in our indigenous stag beetle (*Lucanus Cervus*), which obtains that name from the organs in question standing out from the head, and bearing projections resembling a stag's horn. This is the largest of our native beetles, and it may without impropriety be ranked among the kinds prejudicial to timber, for although the larvæ prefer the wood of the oak when in an incipient state of decay, yet the large holes they perforate have the effect of soon bringing it into that condition. In the male of this species, the mandibles are nearly half as long as the body; the entire length about an inch and three-quarters. The colour is deep brownish black, slightly shining, the mandibles and elytra more or less castaneous. The grub (supposed to have been the *Cossus* of the ancient Romans) is of large size, sluggish in its movements, soft and fleshy, with the hinder extremity of the abdomen considerably enlarged, a circumstance characteristic of the larvæ of the lamellicorn section. The stag-beetle is confined to the more southern counties of England, and even there its distribution is local. It is abundant in Surrey, Kent, Devonshire, &c., but has not been noticed in Cambridgeshire, and some other counties which might have been supposed to be within its range.

Cockchafer (*Melolontha vulgaris.*) The generic distinctions of this well-known genus are derived from the antennæ, which are ten-jointed; the basal joint long, robust, and obconic; the second short; third elongate and slightly clavate; the lamellate club consisting of seven greatly produced joints in the male, and of six short ones in the female; from the maxillary palpi having the terminal joint longest and rather thicker than the others; the head elongate—quadrate, with a reflexed margin, and a suture across the middle; thorax transverse, quadrate, narrowest in front, the sides dilated in the middle and rounded. The anterior tibiæ are dentate externally, and all the tarsi are five-jointed.



The common cockchafer is the only indigenous species of melolontha that occurs in any abundance; the other one included in our British Fauna (*M. Fullo*), is very rarely met with, and may even be considered a doubtful native. Two females of the former are represented on the above woodcut (fig. 1, 2.) The insect is about an inch in length, oblong and convex, the head reddish in front, the hinder part pitchy black, the surface punctured and clothed with long whitish hairs; palpi and antennæ ferruginous ; thorax pitch-black, clothed like the head, the hairs densest towards the sides, near each of which there is a longitudinal patch of a whiter colour than the rest : scutellum black ; elytra bay-coloured, covered with very short hairs, appearing as if powdered with whitish dust, having four elevated lines on each, an elevation near the shoulder, and another near the apex : under side of the body pitch-black, the thorax and breast with long brownish-white hairs, the abdomen with short hairs, the segments having a large triangular spot of white on each side ; the portion of the abdomen protruding beyond the elytra of a triangular form, deflexed, and narrowing gradually to a point : legs ferruginous, the hinder thighs sometimes pitch-black, the anterior tibiæ bidentate externally and margined with black.

The devastations of the cockchafer, which are well known often tooccuron a very extensive scale, are continued both in the larva and perfect state. In the former, it destroys the roots of grass and other plants ; in the latter, the foliage of trees. Its existence as a beetle, however, is fortunately of short duration, in most cases not much exceeding a week ; and the flight of the entire annual brood seldom extends beyond a month. They feed chiefly on the oak, clinging in a half torpid condition to the twigs during the day, and taking wing in the evening and twilight. Their flight is easy, but not very rapid, and they frequently strike against objects in their way, as if unable to change their course suddenly, or as if their vision was defective ; hence the saying, "blind as a beetle." The male speedily perishes after the sexual union, and the life of his partner is a little prolonged, only that she may deposit her eggs in a place of safety. Accordingly, as soon as fecundated, she digs into the soil to some depth by means of her head and forelegs, the spinous expansions on the latter adapting them well for such a purpose. The eggs, which are numerous, are laid in a cluster at the bottom of the hole, which is usually about half a foot beneath the surface. They are white, or very slightly tinged with dirty yellow. The larvæ which proceed from them are soft, inactive-looking grubs, of a dingy white or yellowish colour, and to all appearance totally blind. Indeed it would be of no avail to them to possess the power of vision in a situation where it could not be exercised. When full grown, these larvæ are about an inch and a half in length, the head scaly and rust-red, the rest soft and whitish. The head is furnished with a pair of powerful mandibles, and two antennæ, each composed of five pieces. Six short scaly legs, placed in the pectoral region, are the only instruments of motion; the hinder portion of the abdomen is thick and heavy, and usually somewhat curved inwards beneath the belly. The motions of the creature are in consequence slow and awkward, and the short legs proving insufficient to support effectually the arched back, it frequently falls on its side, as represented in the foregoing engraving (fig. 3).

When the duration of an insect's life is very brief in one of the stages of its development, it is frequently prolonged in another, so that its entire existence extends over a considerable period. A compensatory provision of this kind (if it may be so called) takes place in the present instance. The existence of the mature insect has been already stated to be comparatively ephemeral; that of the larva just described extends to three years. During the whole of that period it is subterraneous, and subsists chiefly on the roots of pasture grasses, but it likewise attacks those of the cereal grasses or grains, and even of shrubs and trees. In the autumn of the first year it descends deeper than usual into the earth, and passes the winter in a state of profound repose, neither requiring nor desiring food. As soon as the solar rays produce their genial influence in early spring, resuming its activity, it ascends within a few inches of the surface, and recommences its ravages. A similar process is repeated in the second year, and in the course of the third autumn after being hatched, it descends to a greater depth than formerly, sometimes not less than five or six feet below the surface, and forms a smooth case in which it is converted into a pupa. The beetle is disclosed early in the ensuing spring, but it is pale and soft, and does not venture to leave its chamber, so far removed from all ordinary dangers, for some time, seldom before May, or even the beginning of June. By that time all the parts have acquired a firm consistency; and working its way to the surface, by means of the same implements which enabled the female to burrow in the soil, it expands its wings and takes to flight, no longer a subterranean dweller, but frequenting the umbrageous branches of the loftiest trees, eager in pursuit of the grand object for which alone it seems to have become a short-lived denizen of the air.

The place which the mother cockchafer generally selects as best adapted for her young, is some rich meadow or old grass land in the vicinity of oak plantations. A favourite resort is the extensive parks surrounding so many country-houses, where the verdant turf is seldom disturbed, and is studded at brief intervals with stately groups of "old ancestral trees." In such situations, especially in the southern parts of England, patches of withered vegetation may frequently be observed, and when examined, it will be found that the roots have been eaten off, and the turf so loosened, as Kirby and Spence remark, that it will roll up as if cut with a turfing spade. But although grass roots be their favourite repast, they consume nearly all other kinds, frequently occasioning an almost total failure of every kind of crop they happen to meet with in their progress.*

When the perfect insects are not very numerous, and seek their food from forest trees, the injury done is scarcely deserving of attention; but when they attack shrubs, where the supply is more limited, or become excessively numerous, almost complete defoliation is the result. Instances of this kind are not of rare occurrence, but the operations of the larvæ are, in most cases, attended with much more disastrous consequences.

The most remarkable instance on record of the extraordinary increase of this insect is given in one of the early volumes of the *Philosophical Transactions.*† In the year 1688 they appeared in the county of Galway, in Ireland, in such multitudes, that, during the day, when they are in a kind of torpid state, they were seen hanging from the branches of the trees in immense clusters, clinging to each other like bees when they swarm: when they took flight in the evening, according to their practice, the humming noise produced by the motion of their wings resembled the distant beating of drums; while the sound arising from gnawing the leaves, when feeding, was not unlike the sawing of timber at a distance. When they rose simultaneously, they formed a cloud which darkened the air for the space of two or three square miles. The forest trees and bushes, over an extensive district, were in a short time stripped of their leaves, and appeared as naked as if it had been the middle of winter; even the fruit trees in gardens did not escape. The insects were eagerly devoured by swine and poultry, which are said to have become fat on such unusual fare; the people also, seeing their nutritious properties, are likewise said to have adopted a mode of dressing them, and to have employed them in the same way. We are unable to say whether the cockchafer be abundant in the present day in the district to which the above narration refers, but it has, no doubt, been so at a former period, for the grub is known in Ireland as the Connaught worm: it is frequently met with in other parts of that country. The flight mentioned by Mouffet as having once taken place in the west of England must have been nearly as extensive as the above, for he affirms that the beetles fell in such quantities into the Severn, that they stopped the wheels of the water-mills. At present they occur in great plenty in most of the southern and central districts of England; they become gradually scarcer as we advance northwards; and in Scotland they never seem to multiply sufficiently to do much harm. Indeed it is not long since the insect was known to inhabit Scotland at all, but of late years single specimens have been found in many and remotely distant localities. We have seen it in the park at Dalkeith House, and have been informed by the proprietor that the larvæ were once dug up, in considerable numbers, at Jardine Hall, in Dumfriesshire. Larvæ have likewise been transmitted for examination to Edinburgh from East Lothian, where they were said to have done injury in a potato field.

---

* Sir John Hill, a writer to whom Natural History owes some obligation, is of opinion that the canker-worm of Scripture, so often mentioned in connexion with the locust for its powers of destruction, is, in all probability, the larva of the common cockchafer, as it is abundant in eastern countries as well as in Europe. He adds, that a few years before the time when he was writing (1757) it had almost created a famine in some parts of England.

† Vol. XIX. p. 741.

Many of these unwelcome visitors fall a prey to birds; and numerous schemes have been put in practice for their further destruction by man. The fern-owl (*Caprimulgus*), and other nocturnal species of the feathered tribe, feed on the perfect insect; rooks delight in the larvæ, and dig to the roots of the herbage in order to obtain them. The skill rooks shew in discovering the places where these grubs are to be found is not a little remarkable. "I have often observed them alight upon a pasture of uniform verdure, and exhibiting no sensible appearance of withering or decay, and immediately commence stocking up the ground. Upon investigating the object of their operations, I have found many heads of plantains, the little autumnal dandelions, and other plants drawn out of the ground and scattered about, their roots having been eaten off by a grub, leaving only a crown of leaves upon the surface. The grub beneath, in the earth, the rooks had detected in their flight, and descended to feed on it, first pulling up the plant which concealed it, and then drawing the larvæ from their holes. By what intimation this bird had discovered its hidden food we are at a loss to conjecture; but the rook has always been supposed to scent matters with great discrimination." * From mistaking the object of the rooks, they are liable to be molested in their useful employment, as in the instance mentioned by Spence, where a farmer affirmed "he couldn't beer to see d'nasty craws pull up all d'gress, and sae he'd set d'bairns to hing up some auld clauts to flay 'em awey. Gin he'd letten 'em alean, they'd *sean hev reated up all d'dose.*"

Blackbirds, thrushes, and others of the larger *Turdi* likewise search for them, and seem to prefer them to most other kinds of food. When the ground where they reside happens to be turned up by the plough, it is generally well cleared by means of birds alone; but when this is not the case, children should be employed to collect them. Ducks and other poultry feed on them with avidity, and may be turned into a newly-ploughed field with advantage. Every female beetle that can be destroyed before oviposition, is equivalent to the death of an entire brood. Attempts should, therefore, be made to secure the beetles when they first make their appearance, and it can be done without great difficulty (except what arises from the height of the trees they frequent) during their daily state of lethargic repose. The branches should be well shaken, and the insects received in a large sheet or net held beneath; or they may be stupified and caused to fall to the ground by smoke being made to ascend through the tree from a smothered fire below. Drenching the land infested by the grubs with some mixture capable of destroying them without damaging the crop, may likewise be recommended. Stable urine is said to possess these properties, but some more active and efficient agent would be preferable, and might easily be devised.

---

* Journal of a Naturalist, p. 179.

Another chafer, similar to the above, prevails in some parts of England later in the season, seldom or never appearing before midsummer. This is named *Amphimalla solstitialis:* it is a smaller insect, of a uniform pale reddish-yellow, covered on all sides with rather long hairs. The antennæ are nine-jointed, the capitulum consisting of three leaves in both sexes; maxillary palpi with the terminal joint considerably dilated and acuminated to the apex. The elytra are rather thinly clothed with pale long hairs, the suture and outer margin brownish, the disk slightly punctured, and bearing four obsolete whitish lines. The anal or exposed segment of the abdomen is somewhat dusky, granulated, and clothed with long erect hairs; the breast densely pubescent; abdomen blackish-brown beneath, the pubescence whitish and adpressed to the surface; legs rufescent.

The grub of this insect is very similar to that of the common cockchafer, and its habits are nearly the same. It is more restricted, however, in its distribution than the species last named, as it seldom appears in any numbers to the north of the midland counties of England. It often abounds in the vicinity of London, and in the counties lying along the southern coast.

Another insect of this section requires a brief notice, as an occasional depredator both on ornamental and useful plants, viz. *Cetonia aurata*, the Rose-chafer, one of the most beautiful of our native insects. It is entirely of a rich shining golden green on the upper side, and of a bright coppery gloss beneath; thorax slightly convex, punctured; scutellum large, very smooth, with a few impressions at the base; elytra with a triangular scale towards the base, interposed between the outer base and the posterior angles of the thorax, the surface with irregular dots and shallow crescent-shaped impressions, the posterior half marked with scattered transverse undulatory white streaks; sternum considerably produced anteriorly. This insect is very plentiful in the south of England, and although we have heard of one instance of its having been found as far north as Morayshire, it must be considered very rare in most of the places intermediate between the two localities named. The larva commits a good deal of damage where it prevails, by feeding in the same way, and on the same parts of vegetables, as the grubs of the other chafers described above. The perfect insect nestles among the petals of roses, and often impairs their beauty by gnawing them.

The only other member of the lamellicorn division to which it is necessary to advert in this place, is one which derives its name from the injury it causes to trees, viz. *Sinodendron cylindricum*, the generic term derived from σινω, I injure, δενδρον, a tree. It is an insect about half an inch in length, of a cylindrical shape, and uniform shining black colour, the antennæ alone being rusty red: these organs are very short, and the dilated leaflets at the extremity are only three in number. The head is armed with an obtuse horn, short and straight in the female, longer and slightly curved in the male. The thorax has five teeth on its anterior margin; the elytra rough and coarsely striated, with irregular impressions scattered over the surface. The larva, which is rather of large size compared with the beetle, forms wide bores in the trunks of trees, particularly of the ash, but it generally attacks the parts beginning to decay, and on that account has been regarded by some writers as doing little harm. But there can be no doubt that, even though it is not considered the primary cause of decay (and yet it is by no means certain that its attacks are not made on the sound wood), it speedily promotes and extends decomposition, by giving access, through numerous perforations, to the air and rain, and allowing the latter to effect a lodgment in the interior of the trunk. The insect is scarce in the more northern districts of the island.

but it is often observed in considerable quantities in the south. According to the observations of the Reverend W. T. Bree, it is often associated with another lamellicorn species in carrying on its mining operations in the heart of forest-trees. This is the *Dorcus parallelipipedus*, or lesser Stag-beetle, a considerably larger insect, and somewhat local in its distribution.

Longicorn-beetles. The coleoptera known by this name are very numerous, and distinguished for the gracefulness of their forms, the body being generally elongated, limbs slender, the antennæ delicately constructed, almost always as long as the body, and in many instances, two or three times its length. The great majority of them, however, are peculiar to tropical countries, and the warmer regions of the temperate zones, where they are found of a size not surpassed by any other insects. Of the species indigenous to Britain, which do not amount to a hundred, the greater proportion are confined to the more southern counties of England, a few only of the smaller kinds extending to the northern quarters of the island. This is owing both to the higher latitude, which every where limits their increase, and to the local accident of there being a deficiency of wood in Scotland. For the larvæ in almost all cases are strictly lignivorous, and, to translate Latreille's words, they do much harm to trees, piercing them often to a great depth, and riddling them with holes. The havock which some of the exotic larvæ of this family are calculated to produce in a beam of timber, may be conceived, when it is mentioned that they are sometimes nearly half a foot in length, and of corresponding thickness, with mandibles of such tranchant qualities, that they can readily gnaw a passage for their owner through a sheet of lead.* The small size and comparatively limited numbers of our native kinds, prevent them doing much injury here; their operations indeed, considered by themselves, are scarcely ever on so extensive a scale as to demand attention; it is only when combined with other hostile influences that they can act with any momentum. It may be safely affirmed that in Scotland, our forest trees never suffer any injury from them at all deserving of notice. The largest species we possess on the north side of the Tweed, is the *Acanthocinus aedilis*, but it has been observed only in two or three localities.* The largest of the English species is *Prionus coriarius*, but it in like manner is by no means generally distributed. The species of the genus *Clytus*, some of which are rather common and easily recognised by the beautiful curved yellow bands across the elytra, feed on the alder and other trees. The genus *Callidium* is one of the most obnoxious to the forester. *C. bajulus* inhabits the Abies excelsa, and the larva often takes up its abode in the interior of a beam where it remains long after the beam has been converted into a rafter, and then works its way out, materially impairing in its progress the strength of the plank, even through the leaden sheeting by which the roofs of houses are frequently protected. *C. violaceum*, the habits of which have been described by Mr Kirby in the Linnean Transactions,† feeds principally on fir timber which has been long felled without having the bark stripped off. The paths formed by the larva are serpentine, and as it proceeds it fills up the space behind it with the excrementitious residue of the saw-dust from which it has extracted the nutritious principle. These galleries are chiefly in the wood lying immediately beneath the bark; but before assuming the pupa state, the larva penetrates nearly into the heart of the trunk, that it may be in greater security during its temporary inactivity. When it makes its escape after becoming a beetle, which takes place in the months of May and June, it effects it by gnawing a passage opposite to the hole by which it entered. This insect would probably not attack timber which had been barked; and it may be mentioned generally, that whenever it becomes an object to protect felled trees from such assailants, it is a good precaution to have it stripped of the bark, as the latter attracts many insects, and affords them a rendezvous, from which they make inroads into the solid wood.

---

* These larvæ are often used by the natives of the countries where they occur as articles of food. This is the case in particular with that of *Macrodontia cervicornis*, a large and remarkable looking species, known throughout Brazil and Cayenne by the name of *Mouche Scieur de long*.

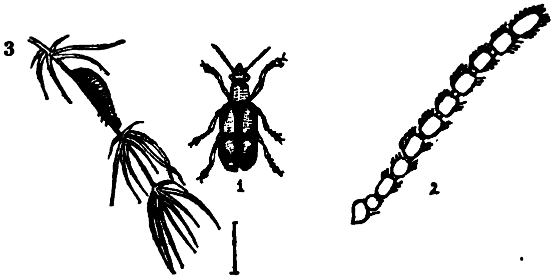
---

* This is the insect which is so well known to the natives of Sweden and Lapland by the name of Timermann, and which they regard with a kind of superstitious veneration. Its presence is thought to be the presage of good fortune, and it is as carefully protected and cherished as storks are by the peasantry of the Low-countries.

† Vol. v.

The larvæ of these insects are mostly apodal, but they are furnished with means of locomotion much better adapted to the cylindrical excavations in which they dwell. The upper and under sides of most of the segments are covered with small prominences or asperities. When about to advance, the larva contracts its body by drawing the two extremities towards each other, and fixing its hinder end to the walls of its hole, by means of the warty prominences mentioned, it extends the anterior part of its body forwards; an operation repeated at each successive advancement. The cocoon is composed chiefly of saw-dust and gnawed portions of wood.

Crioceris Asparagi—Asparagus Beetle. This pretty insect belongs to a section entirely different from the foregoing, both in structure and habits. The generic name (signifying having horns like a ram) refers to the appearance of the antennæ, which are thick and rigid, and usually project forwards in a direct line from the forehead, (fig. 2.) The head is rather wider than the thorax, and is contracted into a short neck behind, the eyes globular and prominent. The whole colouring of the insect is very beautiful, and it is often on that account made choice of as an interesting object for examination with a microscope. The head is blue-black, rather strongly punctured; the thorax bright red, more faintly punctured. The wing-cases are light yellow, with a blue-black band along the suture, united to a quadrate transverse mark of the same colour near the middle, and another towards the hinder extremity; besides these there is a longitudinal one on each shoulder; the outer margin is reddish, the

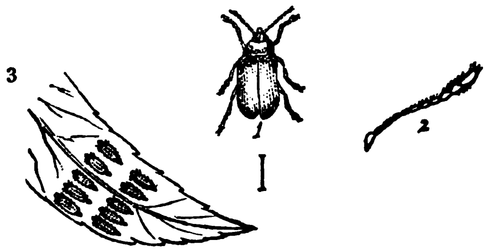


whole surface glossy and marked with punctured lines. The underside and legs are shining blue-black. Length about a quarter of an inch (fig. 1).

The female lays her eggs on the asparagus plants, shortly after they make their appearance in spring. These eggs are long and oval, attached by the end, by means of a dark viscid substance which is extruded along with them; not unfrequently one adheres to the top of another: their colour is a dull slate tint. The larvæ (fig. 3) are nearly of a similar hue, with a tinge of dark green. They are composed of thirteen segments, and move by means of six pectoral legs. The body is without hairs, the head black, the second segment with two shining black dorsal spots. These larvæ attain their full growth in about a fortnight, when they descend into the earth, and are converted into pupæ. They prevail from the beginning of June to September, and it is entirely through their agency that the asparagus plants suffer, the perfect beetle being comparatively innoxious. They select the tenderest and most delicate shoots for their own consumption, and render unpalatable what they do not consume, by communicating to it a fetid and disagreeable odour, which seems to reside in a black matter which they occasionally discharge from their mouths. The market gardens around London are much infested with this larva; but in Scotland we have met with the insect so seldom, that we are inclined to believe it never increases here to a hurtful extent. Picking off the insects with the hand, seems to be the only means of getting rid of them that has been tried. This will be most effectual when the females first appear on the plants, and their bright colours render them so conspicuous, that a little care will prevent any considerable number from effecting their escape.

A very beautiful group of small beetles constitutes the family named *Chrysomelidæ* by systematic writers. They are remarkable, amongst the many sombre-hued tribes with which our northern latitudes abound, for the brilliancy of their attire, in which are blended the most brilliant shades of green, golden-yellow, purple, and blue. All of them are herbivorous, but they fortunately attach themselves to wild plants in general of no direct utility to man. The subordinate group named

Phaedon, however, which differs from Chrysomela, in having the maxillary palpi slender and attenuated at the apex, contains one species, which, judging from what we witnessed of its proceedings last summer, it may be of importance to be on our guard against. This is *P. Vitellinæ*, a small insect, about two lines long, of a uniform shining brassy-black colour, occasionally tinted with violet-blue. The shape of the body is oblong, the head and thorax punctured; elytra with closely punctured lines, the one next the scutellum being abbreviated, and the punctures becoming irregularly scattered towards the sides and apex; underside of the body and legs brassy-black, and almost free from punctures, the tarsi thickly clothed on the underside with short light grey hairs (fig. 4, fig. 2. antenna.) The larvæ are of a yellowish colour. When feeding on the leaves of the willow, they arrange themselves in rows side by side, and advance in regular order, the succeeding file consuming what has been left by their predecessors, so that nothing is left but the reticulated tissue of the leaf resembling a piece of net-work, the whole of the parenchyma or pulpy substance being extracted, (fig. 3.) The beetles likewise consume the parenchyma alone, and they may be sometimes observed feeding side by side like the larvæ, but their lines are never so regular or well preserved. This insect was named Chrysomela vulgatissima by Linnæus, and it certainly on some occasions appears in extreme profusion. During the last autumn, the willows along the banks of the Teviot, were in many places literally covered with them. The consequence was, that the leaves were almost entirely brown and shrivelled, and vegetation nearly at a stand. They likewise frequent poplars, but instances of their inflicting material injury on these trees are comparatively rare.



Bruchus granarius—Pulse-beetle. This insect belongs to a tribe which bears considerable affinity to the weevils, the anterior part of the head being prolonged into a flat blunt rostrum, and the tarsi four-jointed. The antennæ, which are about the length of the head and thorax, and consist of eleven cylindrical joints, thicken gradually towards the apex, and are inserted within a notch of the eye; the elytra do not cover the abdomen, but leave a portion of its extremity exposed. The posterior legs are larger than the others, and the thighs are armed with a strong tooth beneath near the tip. *B. granarius* is from one and a half to two lines in length; of a dusky black colour, sprinkled with a few inconspicuous dots of white pubescence, the anterior legs and the base of the antennæ reddish. The uncovered portion of the anus is very obtuse, and of a dull white. *B. Pisi* is rather a larger species than the preceding, generally measuring a little more than two lines in length. Its colour is brownish-black, with various pubescent spots of a dirty white on the elytra; the uncovered extremity of the body greyish-white, with two large rounded black spots.

Both these insects occur in Britain, but neither of them fortunately is very common: the species last mentioned is very widely distributed, occurring abundantly in continental Europe, and also in North America, where its depredations have occasionally assumed a very serious character. They attach themselves to leguminous plants, particularly beans, vetches, and pease. When the young pods are forming, the female beetle lays an egg in each pea till the contents of her ovarium are exhausted. The eggs are there hatched, and the larva remains in the interior, without producing any external symptom of the grain being unsound. If undisturbed, it continues to inhabit its narrow dwelling throughout the winter and part of the ensuing spring, the substance of a single pea sufficing for its support during that time, which it does the more easily as a considerable period is passed either in a state of dormancy or as a pupa. Having become a beetle, it easily finds its way through the thin epidermis, now the only part of the seed remaining, speedily provides itself with a partner, and continues its kind in the manner described.

We are not aware that these insects have ever proved very detrimental to agriculturists in this country, for they do not seem to increase to a great extent in northern latitudes. But they are among those reserved and latent agents of injury, which a peculiar combination of circumstances may some time or other call into destructive activity. Such was once the case in America, when B. Pisi became so prolific, that in Pennsylvania, New Jersey, and part of the province of New York, the cultivation of pease and the other leguminous plants which it attacked, had for a time to be entirely abandoned; and even in ordinary cases, these crops are rendered very precarious from the same cause.*

We have now noticed all the insects of the Coleopterous Order of any importance which have been recorded as prejudicial to vegetables and their seeds in this country, as well as some others which seemed to merit the attention of husbandmen. Although the list may appear rather formidable, it includes, for the most part, only such as are known to be habitually injurious to the cultivator, and which cannot exist but at his expense, since the plants which it is his object to preserve are the only ones that can afford them nutriment. But it is obvious that, even though greater attention had been bestowed on the subject than it has yet obtained, a catalogue of this nature can scarcely ever be regarded as complete, unless, indeed, it were to comprehend all the phytophagous species indigenous to a country. For in most cases, several species of insects feed on one kind of plant, and any one of these, under a peculiar set of influences, may occasionally become a formidable enemy, although its general character be perfectly innocuous. A familiarity with the proceedings, and methods of guarding against the attacks of habitual assailants, will in general enable the cultivator to devise means to avoid suffering much injury from such casual and incidental depredators.

---

* The great enemy of our pea crops, especially in Scotland (where the Bruchus scarcely ever makes its appearance) is a small false caterpillar of a yellowish-white colour, with two rows of minute black dots across each segment. It is by this creature that nearly all "worm eaten" pease are damaged, and the annual loss it occasions is greater than could be readily credited. It produces a saw-fly, which will be described when treating of the order to which that tribe of insects belongs.

Order DIPTERA.—We now proceed to another primary division of the insect class, including the well known tribe of two-winged flies, of which the common house-fly may be mentioned as a familiar example. The possession of only two membranous wings, without any wing-cases or other instruments of flight, affords an obvious character for distinguishing this group from all others. It is to this peculiarity that the name alludes, being derived from δις, *twice* or *double*, and πτερα, *wings*. Another marked singularity, and the only additional one to which it is necessary to refer to distinguish the order sufficiently for the purposes now in view, is the presence of two slender bodies, clubbed at the extremity, and projecting from each side of the thorax a little behind the insertion of the wings. These are named halteres, balancers, or poisers, and have been supposed by some to represent the hinder wings, and to be of service in balancing the body during flight; but their essential functions have not hitherto been satisfactorily determined. When it is mentioned that these insects are not possessed of cutting-jaws, but of a fleshy proboscis for imbibing fluids, it will at once be perceived that their organization by no means fits them for destroying the substance of plants, like the tribes last described. Indeed, it may be affirmed that vegetables sustain little or no injury from them in their perfect state. But in that condition many of them are well known to be extremely troublesome to various kinds of animals by piercing their skin and sucking their blood. Such are the habits of horse-flies (*Tabanus*, *Hæmatopota*, &c.) and some others, which venture at times, when urged by hunger, to make the sacred person even of the "Lord of the Creation" subservient to their purposes. A few force their eggs into the skin, and others find means of conveying them into the intestines of living animals, thereby producing considerable pain, and often serious diseases. To this tribe also belongs the pestilent musquito, which "murders sleep," alike under the suffocating heats of the tropics and the unsetting light of a Lapland summer,* and of which we are fortunate in possessing such comparatively harmless representatives as common gnats and midges (*culices*).

---

* In a work now in progress of publication, at Leipsic, by Prof. Zetterstedt, on the insects of Lapland, it is asserted that the clouds of gnats and musquitoes which rise from the extensive morasses which cover a large portion of the more northern parts of that country, are so dense and extensive

Although vegetables suffer but little from mature flies, they are far from escaping the attacks of their larvæ. Many useful roots, such as radishes, carrots, onions, &c. fall a prey to them; and the invaluable wheat plant is assailed by certain species (*Cecidomyia tritici* and *destructor*) which take up their abode among the blossoms, and by devouring the pollen, prevent the impregnation of the germen, and consequently the development of the grain. Even the bodies of living animals, when in a state of weakness or disease, frequently become a nidus for these voracious vermin, and present the painful and loathsome spectacle of a moving mass of bloated worms, penetrating the flesh, and even laying bare the internal viscera, without the hapless victims being able to free themselves from their disgusting parasites.

The larvæ of Diptera are as peculiar in their structure and properties as the flies themselves. They are generally of a conical shape, the tail being the narrowest part, in all cases destitute of feet, and, in most instances, to appearance, alike deficient of what is usually considered even a more important appendage, namely, a head. The latter, unlike the same part in other insects, is membranous, that is, composed of a comparatively soft and fleshy substance, from which results the singular anomaly that the creature can change the shape of its head at pleasure, and even draw it entirely within the segment lying behind it. These larvæ, as will readily be supposed, do not live by suction, but are furnished with oral instruments which enable them to divide and masticate both vegetable and animal substances. They are almost always pale and colourless, except in the case of a few kinds which live in the earth. Many of the latter which consume the roots of herbage, in common with the larvæ of the coleoptera, are popularly named grubs, a term which it would be of advantage to employ in the definite sense we formerly recommended. The majority of dipterous larvæ being known as *maggots*, it would be con-

as to intercept the rays of the sun; and that they sometimes fix themselves on such animals as they happen to find in a weakly state, and do not leave them till they have extracted every drop of their blood.

venient to extend that appellation to the whole, and the popular names would thus be rendered co-extensive and equally precise with the scientific designations. With these general remarks, our next object will be to proceed with the description of such species of this order as are to be ranked among the enemies of our plants and animals.

THE AGRICULTURIST'S NOTE-BOOK.—NO. VI.

Home-made bread. To our fellow-countrymen in the "land o' cakes," the above title will possess few attractions; but to those of our farming friends in the south, who reside within a convenient distance of a baker, and from him obtain the supply of bread for their families, we would direct attention to the subject; as well as to those readers of our journal to whom health and economy, are matters of importance. In this season of high priced flour, also—when, if it be ever adulterated, it is too likely now to offer opportunity to the cupidity of bakers, it behoves every one who has a due regard for the important functions of his digestion, to eschew the villanous compound of alum, pearl-ash, and whitning, which there is too much reason to fear, assists in forming a considerable portion of that aliment that has been styled "the staff of life." It was surely prophetically of the present epoch of bread baking in England, that it was written, "Man cannot live by bread alone." Chalk, alum, and pearl-ash, are sorry edibles for a hungry man!

We would not purchase flour of a baker, but of a miller; for the fewer hands through which it passes, before it reaches the consumer, the greater will be his chance of obtaining the article tolerably pure; but fortunate are those, who can defy all adulteration, by having it ground on their own premises by means of portable corn mills. Of minor importance assuredly, when compared with health, is economy; yet few would hesitate to obtain a better material at a less cost than must be incurred for one that is not only dear, but injurious to health.

The vast superiority of home-made bread, over that which is purchased, cannot fail to attract the attention of every one who has seen the two; the former is full flavoured, the latter tasteless and unsatisfactory. The former keeps well for three weeks, the latter not more than three days.

The experience of seven years, in making excellent bread, with the calculation before us, of every item connected with the process, must surely enable us to offer to our readers information on the subject at once valuable from its truth, and practical from its feasibility.

The addition of potatoes is wholly unnecessary, unless it be the intention of a housewife that her product shall resemble that of the baker, in insipidity and whiteness; both qualities will result from the use of that root, which enters largely into the composition of all bread that is purchased; indeed the very best bread is composed only of flour, water, salt and barm. Still, as there exists a prejudice in favour of potatoes, as an ingredient, we will give a concise calculation, which will prove that although even a third part of the flour be exchanged for potatoes—so immense is the quantity of water which they contain—that the substitute would cause a loss rather than a gain.

Flour has lately varied so considerably in price, that we cannot quote one which will suffice as generally available, but we will assume a cost, by which to make our calculation, say a "seconds" flour at 5s. 6d.* per bushel, which in the southern part of the island weighs 56 lb. A batch of bread to consist of 21 lb. will cost 2s. 4d., this flour will absorb so much water, as to yield nearly a third more than its own weight of bread, or seven 4 lb. loaves, value 2s. 4d. If instead of 7 lb. of the flour, the same weight of raw potatoes be substituted, with the hope of saving by the comparatively low price of the latter article, the quantity of bread that will be yielded, will be but a trifle more than would have been produced from 14 lb. of flour only, without the addition of the 7 lb. of potatoes, for the starch of this root is the only nutritive part, and we have proved that but one seventh or eighth of it is contained in every pound, the remainder being water, and innutritive matter. Only 20 lb. of bread, therefore, instead of 28 lb. will be obtained, and this, though white, will be comparatively flavourless, and liable to become dry and sour in a very few days; whereas, without the latter addition, bread made in private families will keep *well* for three weeks, though, after a fortnight, it begins to deteriorate, especially in the autumn.

---

* We cite this price, as that paid by ourselves in 1836, the same quality of flour now, 1839, is 13s.!

The calculation for the above quantity, of 21 lb. is as follows:—

Flour, 14 lb. say at 1¾d per lb.	1s.	5½d.
Potatoes 7 lb. say at 5s. per sack,	0s.	2d.
Yeast and fuel,	0s.	4½d.
	2s.	0d.

The yield will be 20 lb. or five loaves of 4 lb. each at 5d., and dearer than if made from flour only, and of an inferior quality. The price of yeast varies with situation and circumstances, but can always be attainable if the instructions be followed, which were given in this journal page 288 of this volume, or in the number for September 1838. Fuel for the oven will consist of faggots or logs, or furze, or brushwood; and our experience enables us to say, that, for the cost of 3d., a moderate sized oven may be heated. We prefer furze for the first lighting, and to finish with wood of any kind, increasing the size, as the process continues.

Bread made from the best flour is unnecessarily costly; but is more wholesome for those persons who are liable to a relaxed state of the bowels: brown bread, on the contrary, is the cheapest and the most desirable, for persons whose habit of body is of the contrary nature; but there is an intermediate kind, made from flour in which the finer portion of the bran is retained, called locally "seconds," which we greatly prefer; and, after having tried every other, always make use of.

In farm houses, or establishments where a large portion of bran is consumed, much advantage will be gained, by sending a sack of wheat to be ground at a mill, when the bran and flour will be returned to the owner. From one to two shillings is charged for grinding in the south. The weight of the sack of wheat is 240 lb., from which about 178 lb of flour will be obtained.

We will suppose the quantity of flour for a weekly baking, in a family consisting of four or five persons, to be 24 lb.; this, when out of the oven, will weigh about 31 lb. Our undeviating method to ensure success, is to leave nothing to chance or guessing, but to proceed by rule. There will, however, inevitably occur varieties, and anomalies, from various causes, over which we can have no control, that may affect the result slightly, but we are rarely martyrs to a "sad batch," and seldom detect that it is "heavy, or even close." We incline to think that persons are generally deterred from adopting the excellent plan of making their own bread, less from the trouble than the uncertainty that attends the operation; for a few *sad* batches, that are too unwholesome to be eaten, would quickly bring the calculation of the comparative economy of bread purchased, and bread home-made, to a state little flattering to the latter; and as we have been in past years, sufferers from unsatisfactory yields, and have laboured through all disappointments to obtain the state of unerring certainty which rewards us, we do not hesitate to state the result of our experience, and thus hold out encouragement to all who may wish the like success.

We give the preference to an open brown pan, large enough to contain three times the quantity of flour (not with upright sides, but sloping wide to the top like a basin) for the purpose of manipulation, rather than a wooden trough; the former, if well glazed within and without, is sweet and easily kept clean; and is the best receptacle for the loaves, when sufficiently cool, after they are drawn from the oven. A trough or tub, is left month after month, with its sour coating of hard dough, and is an unsightly, and disgusting affair.

Into this pan, the 24 lb. of flour are to be put; and during the winter months, it should be placed near the fire; then having ready some hot water as well as cold, take about half a pint of good thick, sweet, fresh, well washed yeast,* a handful of salt, a pint of bran, and put them into a pitcher, stirring up altogether with *about* (that is a trifle *more or less* than) five quarts of warm water, which feels of a pleasant heat to the finger, for if too hot it will stop fermentation, and if too cold will prevent it; and if a thermometer be used, from 65° to 70° of heat will be found the best range of temperature to ensure a successful working.

---

* To avoid repetition, we refer our readers to the article before alluded to, at page 288 in the September number of this Journal, for 1838.

We say "*about*" the quantity of water, for from various causes, flour will not always absorb the same volume, the state of the atmosphere will operate to prevent absolute certainty; but practice in the manipulation, and observation, will quickly render the process not only easy, but certain. Having made a deep hole in the middle of the flour, pour into it the contents of the pitcher through a sieve, and mix by degrees the whole of the flour lightly together, cover it with a cloth and a thick flannel, and leave it *unkneaded,* for half an hour. This preparatory process we have found to be far better than that which is called "setting sponge," and which is effected by stirring into the hollow in the middle of the pan, a quart of water with the yeast, with flour enough to make it about the consistence of thick batter, and leaving it covered over with dry flour, to rise, for the same length of time we have named. The mass is now to be kneaded, and this operation for a batch of this size, will occupy a strong armed person twenty minutes. As the mass assumes consistency, it must be turned, and moved, and kneaded with the fists, until every portion be thoroughly incorporated, and no loose flour left at the bottom of the pan, or adhering to the sides; it is then to be set (if the weather be cold) before the fire for about an hour and a half, occasionally turning the pan, so as to ensure an equal distribution of heat.

If the process hitherto have gone on well, the dough will swell and rise half-way up the height of the pan; if the ferment have been stale, and the water used too cool, the dough will remain a sullen, tough, inactive lump, and the bread will inevitably be heavy; if the heat of the fire have been too powerful, the dough will have overworked itself, and risen to the top of the vessel, and the loaves will not swell so well in the oven: habit only can produce absolute certainty. When the oven is ready, pieces of the dough are to be cut off, and formed with the hands into shape (two lumps to each loaf) on a clean board well sprinkled with flour, placed on a flat piece of wood with a long handle to it, called a " peel," and taken to the oven. If the quantity be made into seven or eight loaves, they will require to be baked an hour and a quarter. A few words now on the oven, and method of heating it.

A brick oven is indispensable to ensure a certainty in bread baking. An iron oven may bake an occasional loaf, or a tea-cake, but from the very nature of the metal, the method of applying the heat, and the continued attention it requires, the success would be worse than uncertain. A brick oven should be large enough to bake twelve loaves, though it may never contain more than seven; for the expense of heating one of that size, would not amount to more than a farthing above the sum required for one that would be inconvenient, from its small space. For the hebdomadal " baking day," is generally one of extra bustle in the culinary department; when puddings, pies, tarts, and cakes—to say nothing of a joint of meat—are all made to share the oven with the batch of bread.*

As soon as the bread is kneaded, the oven ought to be lighted; it will require as long a period to heat, as the dough will to rise. If neither furze nor brushwood be attainable, the smallest faggot-wood is to be placed on a wisp of straw or shavings, and set light to. It will require some little time to obtain the degree of certainty requisite in order to ensure perfect baking; but the art is not so recondite, that any one need despair of acquiring it in the course of a very few weeks. The criteria of the oven being sufficiently heated, are the floor, and sides, and arch becoming white (the black deposite from the smoke having been burnt off), and the vivid sparkle of the embers which cover the bottom. Another test is, to rub the blackened end of the long stick, which had been used to move the ignited fuel from place to place, on the sides and floor, when it will instantly take fire, and leave a black mark, which will as speedily be burnt clean.

---

* Private families resident in towns, rarely possess the advantage of a brick oven; they can, however, for a trifling " consideration," send their dough to a baker, which is an excellent plan.

The oven should be cleared out with an iron instrument, somewhat like a sickle placed on edge, fixed in a long wooden handle, and then made thoroughly clean by means of a "malkin" or mop, made of pieces of old sacking nailed on to the end of a stick; this must be dipped in water, to prevent it from igniting, and passed rapidly over the floor of the oven. The peel must be well floured to prevent the loaves from adhering to it, and when once they are under the process of baking, the door of the oven ought to remain firmly closed, and opened as seldom as possible.

There are persons who assert—for we have heard them—that there is no economy in baking at home. An accurate and constant attention to the matter, with a close calculation of every week's results for several years—a calculation induced by the sheer love of investigation and experiment—enable us to assure our readers that a gain is invariably made of from 1½d. to 2d. on the 4 lb. loaf. If *all* be entrusted to servants we do not pretend to deny that the waste may neutralize the profit; but with care and investigation, we pledge our veracity that the economy will prove to be considerable.

Subsoil-Ploughing. The last number of the *British Farmer's Magazine* for January 1839, contains a few deprecatory remarks, on an article which appeared in No. 43 of this Journal, entitled "Thoughts on subsoil-ploughing." Had they been dictated by experience, we would most probably not have commented on them, because opinions will vary, and therefore may be expressed, according to the different impressions produced on the mind of the experimenter by practical results; but as the remarks are evidently not founded on experience, but assumed on conjecture, and most certainly have a tendency to propagate and perpetuate pernicious notions with respect to subsoil-ploughing amongst agricultural readers, it seems necessary to caution them against adopting this heresy broached in its pages. It is broadly asserted that subsoil-ploughing may be safely practised independently of thorough-draining. The circumstance which gave rise to the criticism on us is this:—After animadverting in the article alluded to, on Mr Shaw Lefevre having altogether lost sight of thorough-draining, while eulogising the advantages of subsoil-ploughing—and why he eulogised the latter at the expense of the former, we know not, unless he was convinced that tenants might be able to undertake subsoil-ploughing as the cheaper operation, while thorough-draining was too heavy an expense to be incurred by them on tenures at will, as is the condition of most of the tenantry of England—we put the question to Mr Lefevre, "Cannot thorough-draining, with the ploughing-up of the subsoil after a few years, confer exactly all those advantages which Mr Shaw Lefevre here solely ascribes to subsoil-ploughing?" This question our critic sets up as a target, and drives his critical bolt at it in this manner, "We answer, decidedly not;" that is in other words to say, if words have a meaning, that "thorough-draining, even when followed after a few years by a good furrow with the common plough, cannot confer advantage to the soil like subsoil-ploughing without thorough-draining." Now, this assertion is directly in opposition to both the opinion and practice of Mr Smith, whom our critic says we "attacked," but with whom, in fact, we mainly agree, for the circumstances in which subsoil-ploughing should only be practised is thus given by Mr Smith in his pamphlet as his own opinion. "I would not recommend subsoil-ploughing of land which had not been drained;" "for until there is an escape for the water through the subsoil, any opening of it but provides a greater space for holding water, and will rather tend to injure than improve the soil:" and his practice at Deanston has invariably been to thorough-drain the land before attempting not only subsoil-ploughing, but deep-ploughing of any kind. We care not how much people amuse and exercise themselves with subsoil-ploughing, if they think they are to be benefited by it, provided they, in the first instance, thorough-drain their land, because subsoil-ploughing will then certainly be innoxious. But, although these are the sentiments and practice of Mr Smith, our critic's notions with respect to subsoil-ploughing are unfortunately too much in unison with the practice of some farmers, and of many more, we fear, than are heard of; for there is no doubt of the fact of there being farmers in Scotland who subsoil-plough their land, with the view of saving the greater expense, but who are desirous of obtaining the greater advantages, of draining it; a few of whose names we could mention, were it not unfair to expose the actions of persons, who do not obtrude themselves upon the public notice. To encourage them in pernicious practice, by telling them that subsoil-ploughing may be safely prosecuted without previous draining, is to confirm them in error, and especially as such farmers are just those who, having little or no spare capital, or occupying land at will, are so hampered in their circumstances as to be the most likely persons to involve themselves in what they conceive, and are told, is an economical, and, of course, innocent way of obtaining the advantages which others can only attain by a heavy expenditure ; but they are also the least able, from their circumstances, to extricate themselves from the consequences of this miscalled economy. It is all very well for such as our critic, who, perhaps, run no risk by farming, to console themselves with the reflection, that no " sound practical farmer" would so commit himself, or if he did, would soon " rectify such a blunder," when the blunder cannot possibly be rectified in the course of one rotation, and the land most probably not recover its tone in the course of another. The reflection should have preceded, and not have followed, the objectionable advice.

Unconscious as our critic seems to be of the pernicious consequences involved in his peremptory answer of " decidedly not," he, nevertheless, smooths down a little of its asperity by imagining a reason for it that thousands of acres exist which may not want draining. " Thousands of acres" he immediately adds, " which may not (he does not say *do* not, but only assumes, *may not)* want draining, may be essentially improved by breaking up the substratum ; (the subsoil we presume is meant) as for instance, hard chalks and sharp gravels." That there are thousands of acres scattered in detached patches over the country, which really and truly do not want draining, is very possible, but that there are one hundred contiguous acres in one place, which do not want draining, that is, would not be the better for draining, is an assertion which a pretty extensive observation of the face of the country will not permit us to believe.

Of chalky subsoils, whether hard or soft, we have seen abundance both in England and Ireland, which would be very much improved by thorough-draining, and we have had the opportunity of witnessing the cultivation of as dry sharp gravels, as any farmer can desire to raise turnips upon. Sharp gravelly soils have generally an undulated surface, and even in the hollows, where the soil is always the thickest and best in such situations, we have frequently observed turnips in rainy seasons, and rainy portions of a season, present a less thriving appearance than in what would usually be supposed to be less favourable situations. We have also seen oats become *sedgy* on the same kind of soil, in hard dry weather after rain. In both cases we have drained, and suggested to others to drain the land, and the injurious affections alluded to in the crops have thereby been removed, or rather their recurrence prevented, and those drains were cut in a subsoil of sharp gravel and sand, containing excellent materials for drains and boulders of stratified sandstone, extending to the depth at least of twenty-five feet, and how many more we know not. We are aware there are both proprietors and occupiers of land, who act upon the notion that they possess land which do not require thorough-draining. They have settled their minds on this notion, not from any experiment to discover whether their dry land would be the better for draining, but most likely from a dread of expense, and from being satisfied with its fertile powers. To thorough-drain land, however, it is almost superfluous to remark, it is not necessary to execute a drain in every furrow, for the number of drains, or in other words, the distance chosen between them must entirely be regulated by the porosity of the subsoil. Let them try a few experimental drains in the hollows of dry soil, and even on dry rising grounds, where the crops are liable to be burnt up in dry weather, and they will the more readily understand, and better appreciate, the silent but effectual working of drains. Having experienced the advantages of draining portions of very dry sharp soil, it would take a great deal more than mere assertion, to convince us, that there are many contiguous acres in the kingdom, that would derive no benefit from draining. The advantages are not obvious at once, for drains require some time to produce all their effects. Those who use the subsoil-plough, use it *immediately* after draining, and when benefit is derived, it is much more ascribed to the plough than the drain. Let each operation produce its respective advantages, and then it will be seen which are the greater. Our critic then irrelevantly demands, " What would *deep ploughing* do for such soils?" meaning those resting on " hard chalks or sharp gravels ;" and he answers his own irrelevant question by exclaiming, " more harm than good." Very likely, but who eulogised deep ploughing for its own sake? Not we, for we instanced in our " thoughts" several circumstances which tended to shew the inexpediency at any time of practising deep ploughing by extraordinary exertion. But short as this question of our critic is, it involves as nice a bit of disingenuousness as can be found even in Mr Shaw Lefevre's letter to his constituents, and it is only for the purpose of disclosing that, that we notice the question at all, for the question put does not invalidate any statement that we advanced. Our critic eagerly fastens on deep ploughing, in order to depreciate it, but takes care to push out of sight thorough-draining, with which we associated " the ploughing up of the subsoil after a few years," only as an auxiliary, and in this respect shews his dexterity to take a one-sided view of the matter as cleverly as Mr Shaw Lefevre, who completely gave thorough-draining the go-by, in order to help subsoil-ploughing over the stile, because he had predetermined that subsoil-ploughing, without draining, should be a safe and a cheaper occupation for tenants to exercise themselves with, and thereby divert their minds from Parliament more effectually, than would the necessarily expensive operation of thorough-draining.

Careful as those who assume the character of public instructors should be in giving advice on practical subjects, we frequently see the most important subjects in farming treated in a very thoughtless manner. We never observed a more striking instance of thoughtless advice, than what appears, in otherwise, a very sensible communication, from a practical farmer on the subject of subsoil-ploughing, addressed to the *Preston Pilot*, and quoted in the *Mark Lane Ex-*

press of the 28th January last. The writer, after propounding the most orthodox sentiments in regard to subsoil-ploughing, wherein he declares that " it is *indispensable* that the land undergo a thorough drainage *previous* to the introduction of the plough, as deep ploughing in undrained retentive soils is the worst thing possible," gives his opinion of the position and dimensions of the drains. He advises that " drains should be at intervals of four to seven yards (according to the retentiveness of the subsoil), and which should be cut to the depth of two feet and a half, and filled in with broken stones a foot deep; *thereby leaving sufficient space for the perfect operations of the plough.*" The depth of the subsoil-ploughing to be, " first to take a furrow with the common plough to about six inches in depth, following immediately with the subsoil-plough to the depth of sixteen inches." Here it is left uncertain to the reader, whether the subsoil-plough is to penetrate *sixteen* inches below the *six*-inch furrow of the common plough, making the entire depth of the two furrows *twenty-two* inches, or whether it is to penetrate only *sixteen inches below the surface*, and yet it is the settlement of this point that can alone determine the propriety of following the writer's advice; for if the subsoil-plough is to penetrate *twenty-two* inches, and the drain of *thirty* inches is to be filled in with broken stones a foot deep, leaving only *eighteen* inches from the top of the stones to the surface of the earth, it is clear that the plough will pass through *four* inches of the filling, and of course thereby entirely effect the destruction of the drains. This result, of course, the writer cannot mean to advise; but take the only other supposition, that the subsoil-plough is meant only to penetrate *sixteen* inches from the surface of the ground, still that brings its sole to only *two* inches of the surface of the stones; a nearness to which no judicious drainer would wish to approach drains with any instrument, far less to risk the unequal movements of a heavy subsoil-plough, propelled by six horses, through the unusually small depth of *ten* inches, under the furrow of the common plough. If the writer has followed the practice he recommends to others, his furrow drains, we suspect, will be by this time in a sadly dilapidated state.

We are sorry to observe so many loose notions and practices abroad, regarding furrow-draining, subsoil and deep or trench ploughing; and the misfortune is, that, before they can be rectified by the progress of slow *experience*, incalculable mischief will have been effected.

Barberry Mildew.—Farm-Yard Manure. By Mr John Baker, Nassau Cottage, Leeds.—I am induced to make some observations on the paper by Mr Johnson, in No. 42, page 253 of this volume of the Journal, on the Mildew, he having there said that " he never yet met with any facts which establish the charge against the barberry."

When I was a boy, I was taken by my father to a field of wheat, the middle of which, from side to side, was covered with mildew; a large barberry bush grew on one of the hedges, near to a garden, and directly opposite to the portion of the field which was diseased, neither of the ends of the field being at all effected with the malady. My father having before seen the same disease proceeding from the direction of the barberry bush, though in that case the whole of the field was affected, we attributed it to the plant in question, though I believe we had no idea how or why the injury was occasioned. Some years afterwards, I learnt from a botanical friend, to whom I had made some observations on the disease, that the mildew was a plant of the mushroom tribe, which fixed itself on the stem of the wheat, and that the same parasite found a harbour on the leaves of the barberry. I fancied that I could produce mildewed and healthy wheat in the same field in almost any year, and also that I could tell, in almost every year in the first week of May, whether there would be much or little mildewed wheat at the next harvest; I am not quite so sanguine now. My plan was to manure the land intended for mildew very heavily, and to sow the seed late and thin, and to treat the other part in a way directly opposite; and I expected mildew to prevail where the wheat, generally in May, was very thin and backward, in which case the wheat was sure to make a vigorous and unhealthy growth from that time. I published these opinions thirty years ago, and had the honour of a correspondence on the subject with the late Sir Joseph Banks. I must confess myself to be "one of the farmers who are ignorant, that every acre of wheat, in every year, is infested more or less with mildew." Superior cultivation, early and thick sowing, protect the wheat crops generally from this disease, in situations where the fungus has not, as Mr Johnson would call it, a "natural habitat," and where, as I should say, the barberry is, or any other plant which gives protection and support to this mildew mushroom. I know the village of Rolesby (not Rolesbury), in Norfolk, and have heard that it was noted for mildewed wheat, and that, at the same time, barberry bushes abounded there. They have now long been destroyed, and there is no parish in the kingdom where finer wheat is produced, or where the crops are more abundant.

In 1812, I bought an estate at Hockwold, in Norfolk, between 200 and 300 acres of which was so subject to mildew when wheat was sown, that this crop was very seldom ventured on. The hedges were some of them entirely composed of barberry bushes; others had a mixture of them with other plants. I threw down the hedges where it abounded, and took it out of those where there was a less quantity, nor did I sow any wheat on this part of the estate for two years. I then sowed a large part of it with wheat; and I remember in the latter part of the month of May, after a tradesman, who was a respectable and clever man, called on me with his bill; having settled his account, he said, "the field of wheat which I have just passed looks remarkably well," and he added, "I am sorry for it." I expressed my surprise at this, when he replied, "the better it looks the greater will be your disappointment; I have known that field frequently to be sown with wheat, and never knew it to produce much more than the seed, and you may expect the same fate." I told him that I attributed the prevalence of mildew in that neighbourhood mainly to the barberry, and that having destroyed all the bushes on my land, I hoped to be secure from mildew. In short, I reaped forty-eight bushels per acre of excellent wheat from that crop. The following summer I discovered a semicircular spot of wheat of a few roods extent, next a hedge, exceedingly mildewed. After a little search I found a barberry bush growing amongst the white-thorn in the centre of the circle, of which the diseased wheat occupied a half. After shewing this to my neighbours, I removed the bush, and also the diseased wheat; it extended no further. My example was followed in the adjoining village, attended with the same success, nor has mildew been since heard of, except as a matter of surprise, in either parish. If, amongst the numerous readers of this Journal, there be any one who knows a place where barberry abounds, and the wheat growing near it is not liable to mildew, and will communicate the fact, then, but not till then, shall I doubt its pernicious effects.

There can be no doubt but the application of brine to the mildew, when it attacks the wheat, as Mr Johnson has described, will destroy it. The difficulty of applying it is the most important consideration, and the publication of the easiest method of doing so will be of great value. Perhaps the same remedy, which can be much more easily applied, might destroy or prevent the mildew on turnips.

In the same number, at page 299, Mr Pearson, "On the proper management of farm-yard manure," remarks, on reading my mode of applying manure to agricultural purposes, in No. 36, vol. 7., page 584, of this Journal, that I gave no reason why the manure should have the beneficial effects described. My business was to state the facts. I certainly thought the reason why dung applied to the land, in a fresh state, and without any fermentation, effected greater improvement than in the old method of putting it on heaps, turning it over, &c.; because, by the fermentation which necessarily takes place, and the percolation of water through it, which cannot be prevented, a large portion of the most valuable qualities of the dung were carried off. I recommended my plan also on account of the saving of labour and expense.

Italian Ryegrass.—Having observed in the Highland and Agricultural Society's Transactions, vol. 12, p. 478, a few observations by Captain Hamilton of Rozelle, respecting Italian ryegrass, which appears not to have succeeded with him to his satisfaction; and as some of it has come under my observation in the way of cropping, the last two seasons, I take the liberty of stating the results so far as my memory will serve me,—never having intended to put any remarks upon paper about it, until reading Captain Hamilton's statement.

In spring 1836, about two imperial acres of ground (having been drained 18 feet apart, and 2 feet 4 inches deep, were filled with about 14 inches of small stones, and spade trenched 14 inches deep) were top-dressed with compost, immediately after being trenched, and sown with various *(supposed)* standing grasses and clover, but which partly gave way in winter. In spring 1837, the Italian ryegrass seed was sown to fill up the blanks and secure a crop. The seed, after being sown, got the whole of the spring frost, but afterwards produced a very fair average crop, and was ready to cut for hay in July, along with the other grasses sown in 1836; much of it was again cut a second crop.

In spring 1838, about five imperial acres were sown with six bushels of Italian ryegrass seed, mixed with sundry other *(supposed)* permanent grasses (without white crop), few of which grasses made their appearance except as foggage. The ground was drained and trenched the same as above, and afterwards top-dressed with good dung, the seed and dung having been harrowed in together. The produce of the crop was at least 300 stones of hay per imperial acre, much of it being four feet in length. A very heavy second crop followed, some of it nearly as heavy as the first, which I was obliged to cut to save the other grasses. The part of the ground which was top-dressed in winter, was the heaviest part of the crop.

I am of opinion, that Italian ryegrass answers best to be sown upon a strong loam without white crop, having been previously well drained, and sufficiently top-dressed. In this way I have no doubt that, even in this variable climate, two very good green crops, and in some seasons three, might be cut with advantage, yielding in the whole at least from 700 to 800 stones per acre, supposing it to be made into hay.

I am of Captain Hamilton's opinion, that Italian ryegrass is not perennial, nor do I approve of it for hay to horses. As to its usefulness as a pasture grass, I have had no opportunity of proving it.

*Tables of Calculation and Measurement.**—Here are three publications, none of a size which would prevent it from being constantly carried in the coat-pocket, which we think may be referred to with advantage by plain practical men, in different parts of the United Kingdom. We do not say that to skilful and practised accountants they would be of the same value; but, even as to them, we are disposed to think they might be useful, by saving labour. At the same time, it is proper to observe, that as we have not checked the calculations of the authors, so we express no opinion as to the accuracy or inaccuracy of these. We assume that they have been correctly made and correctly printed, and we have seen no reason to suspect any thing else.

In consequence of the changes which, of late years, have been made in regard to the laws respecting weights and measures, not a little difficulty, we are aware, has been experienced by many of the community in estimating the relative proportions between the *old* and the *new* weights and measures; and the laudable object of the publications before us, appears to be to assist in obviating this difficulty.

1. The publication of Mr Taylor, as indeed is set forth in its title-page, which we have copied, is exclusively intended for dealers in wheat. It is divided into two parts—the *first* giving the comparative quantities, and the *second* giving the comparative prices.

---

* 1. The Baker and Agriculturist's Calculator, consisting of Two Parts; the first reduces the given quantity of Wheat to its equivalent, at the standard of 60 lb. per bushel; the second calculates the value. By WILLIAM TAYLOR, Clayslap Mills. Glasgow, 1837.

2. The Land-Measurer's Ready Reckoner, or every man a Land-Measurer; being Tables for ascertaining at sight the contents of any field or piece of land, from three inches up to two thousand yards square, and by mere addition to an infinite extent, all by simply taking the dimensions: also Tables for converting Imperial into Scotch measure, and Scotch measure into Imperial By NEIL M'CULLOCH, Land-Surveyor, Canal and Road Contractor, Falkirk. Glasgow, 1838.

3. Tables for calculating the price of any quantity of Grain from one quart to five hundred quarters, at all the various prices from 15s. to L.4 per quarter, each Table advancing by one penny per quarter. By DAVID HENDERSON, Writer, Edinburgh. Together with Tables for converting the Old Measure of Grain in the different counties in Scotland into Imperial Measure, from one lippy to five hundred bolls. Edinburgh, 1838.

It is, of course, known to all our readers that the standard weight of an imperial bushel of wheat of 4 pecks is 60 lb.; and, accordingly, it is with reference to that standard, that the calculations are made. But it is equally well known that in actual transactions, the wheat may weigh more, or it may weigh less, than 60 lb. per bushel. It is with reference to such variations that the calculations of Mr Taylor may be made available with advantage.

Thus, suppose 17 bolls of wheat are purchased per sample at the rate of 60 lb. per imperial bushel, but that, in reality, each bushel weighs 62¾ lb.; the question is to determine the price to be paid according to the *real* weight, having reference to the *standard*. Now, turning to Part first, page 20, we find on these data, 17 bolls, each weighing 62¾ lb. per bushel, are equivalent to 17 b. 3 f. 0 p. 7 lb., each bushel weighing 60 lb. We thus have the comparative weights.

The second Part gives us the comparative prices. Suppose the wheat was sold at L.1 : 14 : 3 per boll of four imperial bushels. Then, by turning to page 67 we find that 17

bolls would produce . .	L.29	2	3
3 firlots at 8s. 6¾d. (see top of page), .	1	5	8¼
7 lb. at 1½d. (see top of page), . .	0	0	10½
Total,	L.30	8	9¾

And so on, in like manner, as to any other transaction, when the weight and price are different.

2. The publication of Mr M'Culloch is of a different character. It is intended exclusively for professional land-measurers, or for others having an interest in the admeasurement of land. It may be said to be divided into four parts, 1. Tables for determining the contents of a piece of land in imperial measure, where the length and breadth are given; 2. Tables for converting imperial into Scotch measure; 3. Tables for converting Scotch into Imperial measure; and 4. Tables for turning the imperial chain and links, into yards, feet, and inches.

The last three tables, having reference to determinate quantities, are very simple, both in their construction and in their application. It is hardly necessary to say, however, that the first could not possibly be of the same description. If fields or pieces of land were all of a regular shape—no matter whether circular or rectangular—this table, too, might have been of simple construction; but they are, in general, of most irregular shapes. Our author accordingly, in an introduction, gives directions as to the application of his first table, with a view to such irregularities; and it occurs to us, that none, having a tolerable notion of such matters, can fail to understand and to carry those directions into practice.

We could have wished to give examples of the application of Mr M'Culloch's tables, but we regret we cannot afford space to do so; and we must therefore, refer our readers to the publication itself.

3. Perhaps the tables published by Mr Henderson will find more favour with our neighbours than with ourselves. As he justly enough observes, in a very brief preface, " they will be found particularly useful to noblemen, gentlemen, and factors, for calculating grain-rents, to ministers for shewing their stipends, and to farmers and grain-dealers in general." But, in the mean time, although in Scotland, as well as in the other parts of the united empire, the imperial measure is now the legal standard, regulating both bargains and payments, yet we are all fully aware, that inveterate practice is not to be readily set aside, even under the pains and penalties of law. Accordingly, it is notorious, that, in perhaps the majority of instances, grain-rents, feu-duties, ministers' stipends, &c., are, in Scotland, still unconverted from the old to the standard measure. No doubt, all this must be changed with time, and we must have the standard weights and measures carried fully and fairly into effect. At present, however, this certainly has not yet, so far as we can understand, been generally done, though a gradual approximation is making to it. And as, at least, the first part of Mr Henderson's publication has exclusive reference to the standard measures, we are bound to express our doubts whether, for some little time to come, it will be so generally used and referred to in this country, as, we dare say, it deserves to be.

This publication may be described as consisting of two parts, the *first* comprising a set of tables, shewing the price of any quantity of grain, calculated at various rates per imperial measure; and the *next* containing a set of tables for converting the old measure of grain in the different counties of Scotland into imperial measure.

It is well known, that, in former days, weights and measures varied very materially in the different counties and districts of Scotland. In those cases, therefore, where subsisting bargains or contracts are to be regulated by the old measures, the second set of tables must necessarily be useful. The *present* usefulness of the first set, we have, as we have already stated, more doubts about. It is true, there seems to be no question as to their usefulness where the price is to be calculated by the imperial measure; but, in the mean time, a different rule is so frequently adopted in Scotland, that the tables, in themselves, are not generally available off-hand. Yet it is our duty to state, that, by a very simple arithmetical operation, they can be made available. We have the prices of various quantities of grain at so much per quarter: well, 1 imperial quarter of 8 bushels is precisely, in price, as much as 1 boll of 4 imperial bushels: so, halve the price per imperial quarter, and you have the price per imperial boll. In like manner, an imperial bushel is the *fourth* of an imperial boll, and an imperial peck the *fourth* of an imperial bushel; and, by dividing sums according to these relative proportions, the truth will be attained without either great labour or difficulty.

Before concluding, we may give instances of the application of Mr Henderson's tables. Suppose 7 q. 5 b. 1 p. of grain, are sold at L.1 : 8 : 7 per quarter, then, by turning to page 55, we have—

7 quarters, ...	L.10	0	1
5 bushels, ...	0	17	$10\frac{4}{12}$
1 peck, ...	0	0	$10\frac{8}{12}$
Sum,	L.10	18	10

Again, looking to the county of Fife, suppose it were required to convert 9 b. 3 f. 1 p. 2 l. into imperial measure: by turning to p. 275, we have—

	Wheat.					Barley and Oats.				
	Q.	B.	P.	G.	Q.	Q.	B.	P.	G.	Q.
9 bolls, .	4	4	0	1	$2\frac{7}{10}$	6	4	3	0	$2\frac{5}{10}$
3 firlots, .	0	3	0	0	$0\frac{8}{10}$	0	3	1	1	$0\frac{2}{10}$
1 peck, .	0	0	1	0	0	0	0	1	0	$3\frac{8}{10}$
2 lippies, .	0	0	0	1	0	0	0	0	1	$1\frac{4}{10}$

Corn Law Agitation.—Nothing can be more *unfair* than the clamour which has been raised against the corn laws, whether we consider the time at which it has been got up, the statements with which it is supported, or the spirit in which it is conducted.

The clamour is unfair with respect to *time*, because the corn laws have had no share in raising the prices of grain to the pitch which they have sustained during this winter. When prices of wheat vary from 39s. per quarter, the price in 1836, to 79s. the price just now in February 1839, and both co-existent with the same law, it is clear that *it* cannot regulate the home prices more in the one year than in the other. The home prices, under any protective laws, is entirely regulated by the prolificacy or scantiness of our own crops. The clamourers ought to be aware of this. If they are not, they must have been the most unobservant class of subjects in the kingdom since 1836 ; but if they are aware of it, what excuse can be offered for their attempt to raise the present hue and cry against a law which is virtually inoperative ? Had the clamour been raised against all corn laws, in 1836, when the duty was so high as to amount to a prohibition of importation, and when, at the same moment, the country was overtaken by what is called a commercial crisis, on the ground that they prohibit an interchange of commodities with foreign nations, the plea would have then been founded on common sense ; but to wait patiently until Providence has thought fit to visit this country with a scanty crop, the only one since 1816, and then raise the voice of complaint, is nothing less than impiously to murmur at His dispensations.

The clamour is also unfair because of the *spirit* with which it is accompanied. It has been endeavoured to give the clamour a political bias. The same persons commenced the agitation against the corn laws, who have been in the habit of figuring, for some years past, on the public stage of party politics, and the simultaneous movements in all the largest manufacturing towns of the empire, together with the avowed declaration of Lord John Russell to his constituents of Stroud, that the time had arrived when a change in them must be effected, and the determination of the Ministry to make them an open question, that is, one on which they are ready to join with the strongest party, are circumstances which have tended to give a strong political impetus to the clamour.

Last year, a motion affecting the corn laws was lost in the House of Commons by a majority of 300 to 95. Then, that is in 1838, before the harvest, Lord John Russell said, the time had *not* arrived to attempt any change in the corn laws; but now, in the beginning of 1839, after the harvest, he says, the time *has* arrived to warrant a change being attempted in them, although the only difference in their operation since then has been the abeyance of the import duty, to the advantage of the importer of foreign corn, and the permission of foreign corn into free competition in the home market, to the advantage of the consumer.

With a turn of circumstances so very favourable to the consumer, it is difficult to assign a satisfactory reason for this change of opinion, for the one given in his letter, that a fixed duty is better than a fluctuating, does not carry any force with it, inasmuch as he might have expressed the same opinion last year, with as much truth as in this. If the object of expressing such a sentiment is to excite a political agitation amongst the manufacturing population, at a time when the prices of provisions are high, and the minds of workmen excitable, to serve the purposes of party, or to support a falling revenue by the assistance of an impost on foreign grain,—either object is unworthy of a minister, and will most certainly be defeated; but if these are not his object in joining the present crusade against the landed interest, he has not as yet had the candour to acknowledge what it is.

The clamour is also unfair in *spirit*, inasmuch as the clamorous endeavour to make people believe that the protective law, which is essential to the well-being of agriculture, operates fearfully against *their* interests. To test the sincerity of this assumption, it should be borne in mind, that those same clamourers belong to that veritable class of political economists who, when it serves their purpose, protest that the interests of agriculture and commerce are so conjoined that they cannot be separated. There is no doubt those interests *are* inseparably conjoined; but how they can be disjoined only when it happens that foreign corn is admitted into our markets duty free, and at no other time, is a theorem for the consistent advocates of free trade to demonstrate.

The clamour is moreover unfair in *spirit*, when the clamourers complain that foreign nations now manufacture goods for themselves. Who is to blame for this result? Not the agriculturists surely. The clamourers, being keen advocates of free trade, have always urged the impolicy of preventing the emigration of workmen, and the export of work-tools and machinery. Taking advantage of such tempting circumstances, every one of those means of manufacture have been cheerfully welcomed by foreign nations, and wisely employed to their own advantage. When skilful men and useful machinery have been passing over to foreign countries for years back, on the principles on which free trade has hitherto been carried on in this country, the free traders surely cannot imagine that foreigners desired to procure those valuable appliances for mere diversion, to be looked at like models in a museum; or that they would not have the sense to convert their immense resources of water-power to propel the acquired machinery.

Truly our free traders must have a very contemptuous notion of the German intellect, to imagine that, on seeing the great profits realized, and the vast wealth accumulated, by our manufacturers, they would never endeavour to follow so bright an example, in the hope of realizing as rich a harvest from their own enterprise. No doubt our free traders have the most sublime veneration for the manufacturing intellect of this country, which has often thrown down the gauntlet to all the world; but they should take time to consider, that British machinery, worked by industrious hands, and propelled by the cheapest, safest, and steadiest of all known powers, confers advantages, in the ratio of L.2, 10s. by water to L.12, 10s. by steam, on the foreign manufacturer, against which all the steam power and skill of this country in vain compete, even against the phlegmatic German manufacturer. Steam-power has worked wonders for this country; but we cannot help thinking that there has been too much crowding together of manufactures in large towns, and far too much neglect of the thousands of horses' power of water which may be found in many places of this country. Were these appropriated to the purposes of manufacture, they would more than confer all the fancied benefits to be derived from the abolition of corn laws; whilst the comparative isolated situation of the work-people in country districts would be highly conducive to their morals.

But what will be thought of the consistency of the clamourers' complaint against foreigners manufacturing for themselves, when it is stated, that the clamourers themselves have established manufactories abroad. There is actually a spinning-mill established in the neighbourhood of Dunkirk, by British millspinners, and tended by British hands; and this mill was set agoing, not for the purpose of saving labour, for the emigrant labourers from this country must have had inducements held out to them to leave their homes, but only to save the import duties exacted on yarn in France. So that here is a practical proof that it is not the rate of wages in this country that prevents successful competition with foreign manufacturers, so much as the imposition of high duties on exportation; and yet the free traders would make us believe that all the world would receive their manufactures were the corn laws only abolished. The manufacturers have thus no cause to complain of foreigners competing with them in manufactures, when they themselves set them the example, and supply them with the means of competition; for, besides the great export of machinery abroad, amounting to half a million's worth a year, there is an immense increasing export of yarns, from 88,000,000 lb. in 1836, to 115,000,000 lb. in 1838, which the foreigners want for no other purpose than to manufacture into cloth; and so long as they are supplied with yarn, they will of course continue to manufacture cloth, and compete stoutly against our manufacturers in their own country.

The clamour is, moreover unfair in *spirit*, inasmuch as the clamourers have attacked the safety of the agricultural interest unprovockedly. They clamour for the *entire* removal of the protective law to agriculture, regardless of the consequences of such a repeal to the great landed interest. They are not content in craving for the gradual diminution of the protective duties, or even for the substitution of a small fixed duty for the present fluctuating duties, but the *entire repeal* of the corn-laws. Now, such a clamour is ungenerous, and even unjust. It is ungenerous, because the agriculturists were not meddling with them, nor desiring the removal of the protective duties on the importation of foreign manufactures, the amount on many of which exceed the yearly average per centage of the duties on corn; and their conduct is unjust, because they have no right to demand the abrogation of any law, until it has been first ascertained whether such a step would affect the safety of any of the other great interests of the empire.

Now, the clamourers have desired no such investigation as a preliminary step to their demand for an instant repeal. They have *assumed* that the repeal of the corn-laws would greatly improve their condition, by opening new fields of enterprize for their manufactures. This assumption they cannot prove, nor is it probable; for the most successful manufacturers and competitors on the Continent, against British goods, are the Germans and Swiss, and as they raise no more corn than what supplies their own wants, they can give no corn, nor need they take manufactures; and as for those countries from whence corn has been, and is obtained, they never took goods in barter for grain. They always employ their own ships in preference to ours, when they can, and which return in balast, or with stones, or perhaps with coal; but those commodities have nothing to do with manufactures. They take hard cash or good bills, which they appropriate to their own purposes where they please, and as they please. The clamourers have no right to assume that foreigners would act otherwise, even if the trade in corn were free. All the *good* that such a measure would effect, would be to put more cash into the hands of foreign corn-growers, for their *dear* corn—for cheap they would not sell it if the necessities of this country really required it, to enable them the more successfully to compete with our manufacturers.

The transactions of this season have afforded a practical illustration of the truth of what we have just advanced. For all the foreign grain that is importing at this moment, and for all that was liberated out of bond, some time ago, no manufactures were demanded in exchange; and because our necessities are really urgent, those countries that have grain to spare demand high prices for it, whilst others actually prohibit exportation. A pretty predicament would this nation now be in, had there been no bonded corn to resort to, or had the crop been as bad as that of 1816. There is thus wisdom in depending for subsistence on our own soil. Bad as the crop is, we have no doubt but that had the same breadth of wheat been sown last year, as used to be a few years ago, when wheat was cheap, there would have been enough, with what little can be got from abroad, to have kept the prices at a moderate pitch; and we opine, from the great breadth already sown, that let the next crop be as bad as this is, there will be plenty of wheat in the country for its own consumption.

Some manufacturers only desire to establish a fixed for the fluctuating duties, whilst others relinquish all reliance on the duties that prohibit the competition of foreign manufactures. We believe that the present outcry against the corn laws has been almost entirely raised by those manufacturers who export their goods to foreign countries, and that the home manufacturers have too much regard for their own interests, to desire the debasement of agriculture. The agriculturists, they know and feel, are their best customers, in the best sense of the words, being steady, at hand, and discharging their obligations with ready money. They are, moreover, as an interest, by much the largest in the country, the total value of capital in land being L.3,258,910,810, whereas the total capital invested in manufactures is only L.205,773,872, being 15 to 1 in favour of the landed interest; and if we confine our observations to the capital invested in the trade to foreign countries, it will be found not to exceed L.16,361,322,—an insignificant interest, truly, for which to run the risk of ruining our agriculture.

The manufacturers who are willing to relinquish the protective duties on manufactures, when they pray for the repeal of the corn laws, those who display the liberality of submitting themselves to what they wish done to others,—will be found to be those whose trade consists in importing the raw material from, and exporting their goods to foreign countries. There is no wish expressed by the home manufacturer for permission to foreign manufacturers to enter our markets duty free. This good sense the agriculturists wish to imitate, and to retain protection for them as well as for themselves.

The clamourers act with an unfair *spirit*, when they load the agriculturists with the most vituperative epithets. Even admitting that the agriculturists are as obnoxious to the country as their enemies would represent them, it is the interest of the nation itself to protect the largest, and, of course, the most important branch of its industry. The gross produce of all manufactures amounted last year, 1838, to L.271,412,709; that of agriculture, to L.539,036,201 ; and if the export trade to foreign countries is only taken into the comparison, which in justice should be restricted to them, as it is they who have raised and continue the clamour against the corn-laws,—*it* will be found not to exceed in value one-tenth part of the manufacturing, or one-twentieth of the agricultural produce.

A favourite assertion of the clamourers is, that as the corn-laws raise the price of corn to the consumers of this country 10s. a quarter ; and as 50,000,000 of quarters of corn are annually consumed, they thus impose an annual tax of L.25,000,000 on consumers ; and, of course, take as much from their pockets. Willing to overlook the absurdity of leaving out the agriculturists as consumers, if this proposition is true, so must its converse be true also. The manufactures consumed in this country amount to L.245,000,000 a-year; and as manufactures can be purchased abroad fully 40 per cent cheaper than here, it follows, by this mode of reasoning, that the manufacturers of this country put L.98,000,000 a-year more into their pockets than they should.

The clamour, further, is unfair in *spirit*, inasmuch as the profits derived from manufactures is much greater than that from agriculture. It is well known that landed property yields only from 3 to 3½ per cent, and the farmers' profit may be thus stated :—

Total produce from land, . ,	L.539,036,201
Total charges of cultivation, including rent,	527,416,104
Farmers' apparent profit only	L.11,620,097

whereas the capital and charges of manufacture, amounting to L.217,772,872, yield a produce of L.271,412,709.

The clamourers still farther act with an unfair *spirit*, when they charge agriculturists with being monopolists. Monopolists as they may be, they have no wish to deprive the manufacturers of either the foreign or home market; they wish to confine themselves to the home market, and pray the continuance of protection from *foreign* competition only, and not from home competition. They and the home manufacturer thus stand on a footing of equality, in as far as the home market is open to both; but we presume it will not be denied that the exactions on land is much greater than on manufactures. Under the late poor's law, land paid of poor's-rates L.5,453,890 out of a gross sum of L.8,606,501, of which mills and factories only paid L.352,472; but if, as is alleged, that the new poor's law will reduce the poor's-rates L.4,000,000 a-year, still of that sum the land will have to pay 2½ millions. The income-tax paid by land during the war was as 6 to 1 to other kinds of property. The land-tax amounts annually to L.1,203,578. The tithe is a charge upon land and not upon any other kind of property, and their amount annually is L.4,841,050.

The agriculturists make no complaint that these charges are exacted from land, but they do complain when it is attempted to bring foreign competition against them in the home market, with foreigners who pay none of those charges. And they have further cause of complaint when that attempt is made, not by the foreigners themselves, who should first stir in the matter, as they have the greatest interest in it, but by our fellow-countrymen, who, with the desire of serving their own interests, fancy they would attain their object by encouraging foreign agriculture in preference to our own. Such an attempt is especially objectionable, when the question of national imposts is, truly, not between the agriculturists and manufacturers of this country, but between the agriculturists of this and foreign countries.

But the charge of monopoly against agriculturists comes with a worse grace from the shipowners, who have joined the clamour against the corn laws, than even from the manufacturers;—from those, in fact, who enjoy, and have long enjoyed, the entire monopoly of the coasting and colonial carrying trades. The agriculturists do not grudge them their advantages over the foreign shipowners; but they must take upon themselves to admonish them not to throw stones who live in glass-houses.

The *statements* put forth by the clamourers regarding the exclusive advantages possessed by agriculture, are as unfair as the *spirit* in which they are advanced, and the *time* at which they are promulgated.

The corn laws have been denounced as, *par excellence*, the "landlord's tax." We have seen it alleged, that agriculturists derive L.25,000,000 a-year from the corn laws; the landlord's share of one-fifth of this sum only amounts to L.5,000,000; the rest, of course, belongs to the tenants. Who, then, have the greatest interest in maintaining corn laws, the tenants or landlords? Take away L.20,000,000 a-year from the tenants, and L.5,000,000 a-year from the landlords, and see which would soonest and longest feel the deprivation.

But the tenant is flattered with the assurance, that when his rent must be reduced on the free import of foreign corn, his condition will relatively be the same as now; but the tenant is wise enough to know that rent only constitutes one item of his expenses, and that he has many others besides; and, that the wages of farm-servants being already as low as nature can subsist upon, he can look to no relief of expenditure from that quarter. In short, he knows from common sense, that he cannot possibly raise corn as cheap in this country, highly taxed as it is, and possessing generally poor soil, and a variable climate, as farmers can abroad, who pay little or no taxes, and who live, if not on good soil, in a fine climate.

The clamourers admit, that some of the land will go out of cultivation in this country, under competition with foreigners; but they allege that that land should never have been taken into cultivation, on account of the expense it entails in its cultivation. By the same sort of reasoning, the national debt should never have been contracted, because it entails a burden upon the industry of the country. But the question now, is not, whether that land should ever have been cultivated; but, having been cultivated, that is, a large capital having been invested in it, whether that capital should be abandoned, for the sake of our foreign export trade? They who advise that that land should be thrown into grass to produce more mutton and beef, so advise it in utter ignorance of agricultural management. That land is naturally the poorest in cultivation, and although it has been improved in quality, by means of cultivation, it requires to be periodically fed, to maintain its fertility. In this state, under the plough, it yields good crops of turnips, oats, and even barley, and a pretty good pasturage for two years; but sow it down; the grass upon it will not maintain a Leicester sheep to the acre. Poor land will not permanently grow feeding grass. Here, then, would an actual loss be sustained in grass for supporting live-stock in summer, but a still greater loss in the turnip crop, for the sustenance of the same live-stock in winter. So far, therefore, would the live-stock {from being increased in number by throwing the poorer lands into permanent grass, they would be materially diminished.

Besides, as the natural permanent grasses in this country, with its ungenial climate, cannot *feed stock in winter*, other food, turnips, are required to sustain the condition on them in winter, which had been acquired on the pastures in summer; and to accomplish this result in the most satisfactory manner, it is necessary that the number of the live stock bear a relative proportion to the acres of land under cultivation. This proportionate relation should be the more scrupulously adhered to, the higher bred, and the younger the stock that is attempted to be fed off. The clamourers of course do not know, that more stock is thus kept on cultivated land, than on ground in permanent natural pasture, except on chosen spots in the fine parks of England; and, of course, to do any thing to throw that land out of cultivation, is just to do so much to lessen the number of heads of stock, instead of increasing them, as is unwittingly advised by the clamourers, in the plentitude of their wisdom in farming.

The clamourers being political economists, perhaps believe in Ricardo's doctrine of rent, which says, that rent increases as inferior land is brought into cultivation. If a rise of rent then be a natural consequence, it follows, that as the land on the continent shall be brought into cultivation, on the free importation of foreign corn into this country, the price of corn will rise abroad; but as the object of the clamourers for importation duty free, is to obtain cheaper corn, their object will thus, according to their own doctrine, be frustrated. The clamourers, it seems, anticipate this difficulty, and consider, that they will be equally advantageously placed, in reference to the foreign manufacturer, if the price of foreign corn rise, so as to raise the wages of foreign labourers. But they do not seem to know, that although the price of wheat would thereby be raised to the consumer in this country, the wages of foreign labourers would not necessarily rise in proportion, because the labourers there do not depend on wheat for subsistence, but rye, which the foreign manufacturer would endeavour to obtain as cheap as possible, in order to keep down the price of wages. If the price of foreign wages rose, it would be in consequence of the demand for labourers, and not in consequence of the price of the wheat sent duty free to this country.

These are a few general remarks which occur to us on the question now broached of *repealing* the corn-laws. We had prepared a great mass of interesting matter, illustrative by tables, of what we have advanced, and of much more that may be said on the subject. But our space is limited, and prevents our giving numbers of very useful tables of reference, which our readers will have an opportunity of perusing on a future occasion.

To those who wish to pursue the subject farther just now, we recommend the perusal of the manifesto put forth by the Manchester Chamber of Commerce, as containing all that can be advanced by the repealers, and that all has been much more than annihilated by the powerful letter of Mr James Macqueen to Lord Melbourne.

TABLES &c.

The MONTHLY RETURNS, published in terms of 9th Geo. IV. c. 60, shewing the Quantities of Corn, Grain, Meal, and Flour imported into the United Kingdom in each Month ; the Quantities upon which duties have been paid for home-consumption, during the same Month ; and the Quantities remaining in Warehouse at the close thereof, from 5th November 1838 *to 5th February* 1839.

Month ending	IMPORTED.			CHARGED WITH DUTY.			REMAINING IN WAREHOUSE.		
	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total.	From Foreign Countries.	From British Possessions.	Total
Nov. 5. 1838.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.	Qrs. Bu.
Wheat, . .	24,906 7	. .	24,906 7	11,194 3	. .	11,194 3	9,352 7	172 4	9,525 3
Barley, . .	. .	. .	. .	772 3	. .	772 3	11,568 4	. .	11,568 4
Oats, . . .	5,141 4	. .	5,141 4	3,948 2	. .	3,948 2	239,342 4	. .	239,342 4
Rye, ...	. .	. .	. .	. .	. .	. .	5,322 5	. .	5,322 5
Pease, . . .	199 6	. .	199 6	2,750 4	. .	2,750 4	29,658 3	. .	29,658 3
Beans, . .	2,042 2	. .	2,042 2	40,544 0	. .	40,544 0	10,758 5	. .	10,758 5
Totals,	32,290 3	. .	32,290 3	59,209 4	. .	59,209 4	305,898 4	172 4	306,071 0
Dec. 5.									
Wheat, . .	44,203 5	. .	44,203 5	489 7	. .	489 7	52,363 0	172 4	52,535 4
Barley, . .	. .	. .	. .	. .	. .	. .	11,447 4	. .	11,447 4
Oats, . . .	2,972 7	. .	2,972 7	36 7	. .	36 7	238,593 4	. .	238,593 4
Rye, ...	. .	. .	. .	. .	. .	. .	4,824 5	. .	4,824 5
Pease, . . .	981 0	. .	981 0	2,905 1	. .	2,905 1	27,293 5	. .	27,293 5
Beans, . . .	559 2	. .	559 2	45 3	. .	45 3	10,447 3	. .	10,447 3
Totals,	48,716 6	. .	48,716 6	3,477 2	. .	3,477 2	344,969 5	172 4	345,142 1
Jan. 5. 1839.									
Wheat, . .	212,583 2	0 2	212,583 4	259,480 4	. .	259,480 4	6,230 3	172 6	6,403 1
Barley, . .	. .	. .	. .	. .	. .	. .	11,409 4	. .	11,409 4
Oats, . . .	3,582 2	. .	3,582 2	138 5	. .	138 5	239,668 7	. .	239,668 7
Rye, ...	1,781 0	. .	1,781 0	1,146 7	. .	1,146 7	5,078 6	. .	5,078 6
Pease, . . .	8,807 4	. .	8,856 3	5,271 3	48 0	5,319 3	30,316 5	. .	30,316 5
Beans, . .	2,830 7	48 7	2,830 7	1,065 5	. .	1,065 5	13,887 7	0 7	13,888 6
Totals,	221,584 7	49 1	229,634 0	267,101 0	48 0	267,151 0	306,592 0	173 5	306,765
Nov. 5. 1838	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr.
Flour, . . .	7,614 2 2	4,444 0 14	12,058 2 16	111 2 6	4,452 3 20	4,564 1 26	8,362 0 26	4,634 1 22	12,996 2
Oatmeal, .	. .	. .	. .	. .	. .	. .	276 2 7	. .	276 2
Totals,	7,614 2 2	4,444 0 14	12,058 2 16	111 2 6	4,452 3 20	4,564 1 26	8,638 3 5	4,634 1 22	13,273 0
Dec. 5.									
Flour, . . .	2,595 1 5	20,359 0 0	29,954 1 5	141 0 0	23,678 0 21	23,819 0 21	15,539 0 27	1,315 1 1	16,854
Oatmeal, .	3 0 6	. .	3 0 6	. .	. .	. .	276 2 7	. .	276
Totals,	2,598 1 11	20,359 0 0	29,957 1 11	141 0 0	23,678 0 21	23,819 0 21	15,815 3 6	1,315 1 1	17,131
Jan. 5. 1839.									
Flour, . . .	63,603 2 11	8,396 2 11	72,000 0 22	56,738 0 2	5,305 0 8	62,043 0 10	21,163 0 20	4,648 1 0	25,806 1
Oatmeal, .	4 2 17	. .	4 2 17	0 0 8	. .	0 0 8	281 0 6	. .	281
Totals,	63,608 1 0	8,396 2 11	72,004 3 11	56,738 0 10	5,305 0 8	62,043 0 18	21,444 0 26	4,643 1 0	26,087 1

PRICES of BUTCHER-MEAT.

Date.	SMITHFIELD, *Per Stone of* 14 lb.		MORPETH, *Per Stone of* 14 lb.		EDINBURGH, *Per Stone of* 14 lb.		GLASGOW, *Per Stone of* 14 lb.	
	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.	Beef.	Mutton.
1838. Nov.	6/6 to 7/6	6/6 to 7/9	6/3 to 7/3	6/6 to 7/3	6/ to 7/3	6/ to 7/6	6/6 to 7/3	6/3 to 7/6
Dec.	6/9 7/9	6/6 7/6	6/6 7/9	6/6 7/6	6/3 7/6	6/6 7/9	6/9 7/9	6/3 7/9
1839. Jan.	6/9 8/	7/ 8/	6/9 7/9	6/9 7/9	6/9 7/6	6/9 7/9	6/9 7/9	6/9 7/9

TABLES OF PRICES, &c.

Average Prices of the different kinds of GRAIN, per Imperial Quarter, sold at the following Markets:—

LONDON.

ate.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
838.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
ov. 2.	69 9	33 10	23 8	36 10	41 2	36 3
9.	74 2	36 0	23 9	37 3	42 6	37 7
16.	76 9	36 6	24 2	38 6	42 10	40 4
23.	76 6	36 11	24 6	39 0	43 2	39 2
30.	76 2	36 7	25 1	40 8	43 8	40 7
ec. 7.	77 11	37 2	26 4	41 6	44 2	39 11
14.	79 9	38 5	27 2	42 6	44 6	40 9
21.	80 10	39 1	27 8	43 8	43 6	40 10
28.	80 9	39 6	28 1	45 8	44 0	40 10
1839.						
n. 4.	81 4	40 0	28 11	48 2	43 2	40 0
11.	83 0	43 5	28 6	50 4	43 6	40 4
18.	82 8	43 3	28 1	52 6	42 8	40 9
25.	79 7	45 0	28 0	52 2	42 2	41 1

DUBLIN.

Date.	Wheat per Bar. 20 St.	Barley per Bar. 16 St.	Bear per Bar. 17 St.	Oats per Bar. 14 St.	Flour per Bar. 9 St.
1838.	s. d.	s. d.	s. d.	s. d.	s. d.
Nov. 2.	41 8	17 2	14 10	12 3	19 0
9.	42 5	17 1	15 6	13 8	20 6
16.	42 4	19 4	17 2	12 4	19 2
23.	41 0	19 6	17 0	13 9	25 2
30.	43 4	20 4	18 2	14 4	25 6½
Dec. 7.	43 2	22 10	19 6	15 6	25 9½
14.	41 6	22 4	19 0	14 11	25 11½
21.	41 10	21 11	18 10	14 10	25 10½
28.	45 3	22 6	19 4	15 3	25 10½
1839.					
Jan. 4.	43 2	23 8	20 0	15 10	25 9½
11.	42 3	24 5	20 2	16 7	26 3½
18.	41 11	24 0	19 6	15 11	26 3
25.	42 6	23 5	18 10	16 2	25 10

LIVERPOOL.

ate.	Wheat.	Barley.	Oats.	Rye.	Pease.	Beans.
1838.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
ov. 2.	71 1	32 6	23 1	36 6	41 2	43 7
9.	73 3	30 4	24 9	35 10	40 2	44 4
16.	72 9	34 6	25 3	36 6	41 6	45 7
23.	71 1	34 0	24 10	37 6	42 0	42 2
30.	71 5	36 2	25 2	38 4	42 6	45 10
ec. 7.	75 8	35 5	25 10	39 10	43 0	43 1
14.	77 3	38 7	26 6	40 8	43 9	47 3
21.	73 3	39 10	26 6	42 6	44 0	40 10
28.	70 7	42 0	27 1	44 2	43 6	47 7
1839.						
an. 4.	74 0	42 2	27 8	46 6	42 6	48 1
11.	79 9	41 10	26 8	48 4	43 0	47 11
18.	73 7	44 4	29 2	49 8	42 8	46 0
25.	74 7	40 9	27 10	50 10	42 2	46 10

EDINBURGH.

Date.	Wheat.	Barley.	Oats.	Pease.	Beans.
1838.	s. d.	s. d.	s. d.	s. d.	s. d.
Nov. 7.	73 0	35 6	24 10	43 10	43 0
14.	71 8	35 5	25 6	44 2	43 6
21.	71 3	34 6	27 8	44 8	44 6
28.	73 10	36 9	28 8	44 2	43 8
Dec. 5.	74 2	38 0	29 6	44 4	43 6
12.	73 7	37 10	29 4	43 2	42 8
19.	72 4	38 0	28 9	42 6	42 0
26.	73 6	41 0	29 3	43 9	43 0
1839.					
Jan. 2.	75 8	42 6	29 10	42 9	42 4
9.	76 2	41 6	30 7	41 8	40 6
16.	75 6	40 0	30 2	42 3	41 6
23.	73 8	41 6	29 4	43 7	42 8
30.	71 6	42 3	30 2	43 4	42 6

BLE shewing the Weekly Average Prices of GRAIN, made up in terms of 7th and 8th Geo. IV. c. 58, and the Aggregate Averages which regulate the Duties payable on FOREIGN CORN; the Duties payable thereon, from November 1838 to February 1839.

ate.	Wheat.			Barley.			Oats.			Rye.			Pease.			Beans.		
	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.	Weekly Average.	Aggregate Average.	Duty.
838.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
ov. 2.	69 5	65 10	21 8	32 2	31 6	15 4	22 11	22 7	13 9	37 3	34 8	18 3	41 3	40 9	9 6	39 3	39 4	11 0
9.	72 11	67 6	18 8	33 6	31 9	15 4	23 1	22 8	13 9	38 11	35 5	16 9	42 11	41 2	8 0	40 2	39 5	11 0
16.	73 10	69 0	13 8	34 3	32 2	13 10	23 8	22 10	13 9	39 3	36 3	15 6	42 8	41 8	8 0	41 0	39 7	11 0
23.	73 4	70 3	10 8	34 1	32 7	13 10	24 1	23 1	12 3	41 0	37 4	14 0	43 0	41 11	8 0	40 2	39 9	11 0
30.	73 1	71 6	6 8	33 7	33 4	12 4	24 3	23 5	12 3	42 5	38 7	12 6	44 0	42 6	6 6	40 11	40 1	9 6
ec. 7.	75 6	73 0	1 0	34 5	33 8	12 4	25 1	23 10	12 3	43 9	40 5	9 6	44 5	43 1	5 0	40 6	40 6	9 6
14.	78 4	74 6	1 0	36 2	34 4	10 10	25 5	24 3	10 9	48 8	42 4	6 6	43 9	43 6	5 0	41 10	40 9	9 6
21.	78 4	75 5	1 0	36 10	34 11	10 10	25 10	24 9	10 9	50 6	44 3	3 6	44 1	43 8	5 0	41 10	41 0	8 0
28.	78 9	76 1	1 0	37 5	35 5	9 4	26 3	25 2	9 3	52 6	46 5	1 0	43 8	43 10	5 0	40 11	41 0	8 0
839.																		
n. 4.	80 2	77 3	1 0	38 3	36 2	7 10	24 10	25 7	9 3	52 0	48 3	1 0	43 11	44 0	3 6	41 11	41 4	8 0
11.	81 6	78 8	1 0	40 4	37 3	6 4	26 8	26 0	7 9	51 11	49 10	1 0	42 5	43 9	5 0	41 8	41 5	8 0
18.	81 4	79 8	1 0	42 4	38 7	4 10	24 9	26 4	7 9	52 4	51 4	1 0	43 3	43 6	5 0	42 1	41 8	8 0
25.	79 3	79 9	1 0	42 5	39 7	3 4	27 0	26 7	7 9	49 3	51 5	1 0	42 0	43 3	5 0	41 8	41 8	8

THE REVENUE.

ABSTRACT of the Nett Produce of the Revenue of Great Britain, in the Quarters and Years ended on the 5th of January 1838, *and 5th January of* 1839,—*shewing the Increase and Decrease on each head thereof.*

	Quarters ended Jan. 5.		Increase.	Decrease.	Years ended Jan. 5.		Increase.	Decrease.
	1838.	1839.			1838.	1839.		
	£	£	£	£	£	£	£	£
Customs, ...	4,523,278	4,854,388	331,110	. .	18,826,284	19,154,729	328,445	. .
Excise, ...	3,590,864	3,627,190	36,326	. .	11,794,338	11,864,114	69,776	. .
Stamps, ...	1,544,400	1,521,123	. .	23,277	6,432,153	6,612,927	180,774	. .
Post-Office, . .	376,000	365,000	. .	11,000	1,517,743	1,525,000	7,257	. .
Taxes, ...	1,579,028	1,586,689	7,661	. .	3,677,748	3,654,818	. .	22,930
Miscellaneous,	174	6,340	6,166	. .	34,936	50,947	16,011	. .
	11,613,744	11,960,730	381,263	34,277	42,283,202	42,862,535	602,263	22,930
	Deduct Decrease,		34,277		Deduct Decrease,		22,930	
	Increase on the Qr.		346,986		Increase on Year,		579,333	

INDEX.

INDEX.

Aberdeenshire, fiar prices of, for crop and year 1837, 157.

Agricultural Chemistry, No. I.—soils, 123.—No. II. carbon, 226—oxygen, 227—hydrogen, 228—vegetation, 229—food of plants must be soluble, 236—how rendered so, 239—No. III., 421—draining, 423—paring and burning, 425—ploughing and harrowing, 433—winter fallowing, 434—summer fallowing, 435—No. IV.—manures, 546—1. organic manures, 551—(1) vegetable manures, green plants, 552—rape-cake, 553—malt-dust, ib.—water of hemp and flax, 554.—sea-weeds, ib.—dry straw, 555—mere woody fibre, 559—(2) animal manures, excrements, 560—urines, 561—hair, woollen rags, feathers, 562—dead animals and fish, ib.—blubber and horn, 563—(3) vegeto-animal manures, farm-yard dung, ib.

Agriculture, of the county of Roscommon in Ireland, on the, 200—of Hindostan, No. III., 317—studies in, No. III. 353—of the county of Kilkenny, 475.

Agriculturist's Note-book, No. III.—improvements in thrashing machines, 64—railways and agriculture, 68—earthing up of potatoes, 77—coffee, 80—artificial dressing and feeding up of tups for sale, 87—the ægrostis segetum, 89—kohl rabi, 93—lucerne and saintfoin, 95—abuses of bone manure, 99—extended use of machines for sowing grain, 103—strictures on potato culture, 106—English Agricultural Society, 110—destruction of shrubs, 114—the grinding bill, ib.—corn-laws, 118.—No. IV.—small-pox, 283—vaccination in Paris, 288—barm or yeast, ib.—effects of successive crops of potatoes, and curl, by Mr James Falconer, Balnakettle, Kincardineshire, 293—best and safest wash against smut, 297—grease for wheels and machinery, 298—liniment for the galled backs of horses, ib.—poa nervosa, ib.—proper management of farm-yard manure, by Mr John Pearson, Kinlet, near Bewdley, Worcestershire, 299—Lyon's treatise on trees, reviewed, 301.—No. V.—The Suburban Gardener and Villa Companion, 452—drain-filling harp, 456—simple method of carrying trees for transplantation, by William Glencorse, Esq. of Luxtowe, Liskeard, 457—insects in provisions, 458—farmers versus rooks, by James Stewart Menteath, Esq. 464—effects of pulverization, 469—No. VI.—home-made bread, 583—subsoil ploughing, 589—barberry mildew; farm-yard manure, by Mr John Baker, Nassau Cottage, Leeds, 595—Italian rye-grass, 597—Tables of calculation and measurement, by William Taylor, for reducing the quantity of wheat to the standard of 60lb. per bushel, 599—by Neil M'Culloch for land-surveying, ib.—by David Henderson, for converting old measures into new, ib.—corn law agitation, 603.

Air, its uses and abuses described, 272.

Aiton, Mr, his remarks on draining land, with a description of the mole-plough brought from England by his Grace the Duke of Hamilton, 388.

Arboretum Britannicum, reviewed, 55.

Archbishopric of Glasgow, fiar prices of, for crop and year 1837, 158.

Argyleshire, fiar prices of, for crop and year 1837, 157.
Ayrshire, fiar prices of, for crop and year 1837, 157.

Baker, Mr John, Leeds, his proofs hatthe barberry affects wheat with mildew, 595.
Balden, Mr James, his strictures on potato-culture, stated, 106.
Banffshire, fiar prices of, for crop and year 1837, 157.
Barm or yeast, how to prepare it for domestic use, 288.
Barberry, exonerated from causing the mildew in wheat, 264—facts adduced to prove it to be the cause of mildew in wheat, 595.
Berwickshire, fiar prices of, for crop and year 1837, 157.
Blackadder, Mr William, on measuring growing timber, 242.
Bone-manure, its improper uses pointed out, 99.
Butcher-meat, prices of, at Smithfield, Morpeth, Edinburgh, and Glasgow, from Feb. to April 1838, 156—May to July 1838, 316—August to October 1838, 473—November 1838 to January 1839, 614.
Buteshire, fiar prices of, for crop and year 1837. 157.

Caithnesshire, fiar prices of, for crop and year 1837, 157.
Cattle, importation of them into France, 310.
Central Agricultural Society, its political constitution condemned. 111.
Clackmannanshire, fiar prices of, for crop and year 1837, 157.
Coffee, it properties as a beverage extolled, 80.
Corn-laws, an absurd argument against them exposed, 118—have worked well, 471—agitation regarding them, 603.
Cheese, manufacture of, from potatoes, 311.
Curl in potatoes, how prevented, 296.

Draining, thoughts on, as a subject of compact betwixt landlord and tenant, 221—tile soles should always be used in tile, 226—land with the mole plough described, 391—theory of, 423—harp for filling drains described, 456.
Draining plough of Mr Macewan does not seem adapted for general use, 451.
Dublin, prices of grain at, from February 2. to April 27. 1838, 155—May 4. to July 27. 1838, 315—August 3. to October 26. 1838, 474—November 2. 1838 to Jan. 25. 1839, 615.
Dumbartonshire, fiar prices of, for crop and year 1837, 157.
Dumfriesshire, fiar prices of, for crop and year 1837, 157.
Duncan, James, M.W.S., his account of insects most injurious to vegetables and animals, and the means best calculated to counteract their ravages, 1, 394, 565.

Edinburgh, prices of grain at, from January 31. to April 25. 1838, 155—prices of butcher meat at, from February to April 1838, 156—prices of grain at, from May 2. to July 25. 1838, 315—prices of butcher-meat at, from May to July 1838, 316——prices of butcher-meat from August to October 1838, 473—prices of grain at, from August 1. to October 24. 1838, 474—prices of butcher-meat at, from November 1838 to January 1839—prices of grain at, from November 7. 1838 to January 30. 1839, 615.
Edinburghshire, fiar prices of, for crop and year 1837, 157.
Œgrostis segetum, an insect, described, 89.
Elgin and Morayshires, fiar prices of, for crop 1837, 157.
English Agricultural Society, its formation described, 110.

Falconer, Mr James, on the effects of successive crops of potatoes, and curl, 293.
Farm-yard manure, proper management of, 299, 597.
Farmers *versus* rooks, reviewed, 464—luxuries, 503.
Fearnside, Mr W. Gray, his retrospect of the British and foreign corn trade given, 134.
Fiar prices of the different counties of Scotland for crop and year 1837, 157.
Fifeshire, fiar prices of, for crop and year 1837, 157.

Forcing-pit, one of simple construction, described, 510.
Forfarshire, fiar prices of, for crop and year 1837, 157.

Geese as barometers, 311.
Glasgow, prices of butcher-meat at, from February to April 1838, 156—May to July 1838, 316—account of the Highland and Agricultural Society's show at, in 1838, 439—prices of butcher-meat from August to October 1838, 473—November to January 1839, 614.
Glass, improvement in, 311.
Glencorse, William, Esq. of Luxtowe, Liskeard, his method of carrying trees for transplantation, 457.
Gorrie, Mr A., defends his theory of the potato failure, 78.
Grain, prices of, at London, Dublin, Liverpool, and Edinburgh, from February to April 1838, 155—weekly and aggregate averages of foreign, from February 2. to April 27. 1838, 155—monthly returns of foreign, from February 5. to April 5. 1838, 156—weekly and aggregate averages of foreign, from May 4. to July 27. 1838, 315—monthly returns of foreign, from May 5. to July 5. 1838, 316—from August 5. to October 5. 473—weekly and aggregate averages of foreign, from August 3 to October 26. 1838, 474—monthly returns of foreign, from November 5. 1838 to February 5. 1839, 615—weekly and aggregate averages of foreign, from November 1838 to January 1839, 615.
Grain-sowing machines, their extended use recommended, 103.
Grease for wheels and machinery, 298.
Grinding-bill, the, the renewal of it deprecated, 114.

Haddingtonshire, fiar prices of, for crop and year 1337, 158.
Hay-making, on, 35.
Henderson, Mr David, his tables for converting old measures of grain into new explained, 601.
Highland and Agricultural Society's show at Glasgow in 1838, an account of it, 439.
Highlands and Islands of Scotland, causes of the destitution of food in them in 1836 and 1837 pointed out and remedies proposed against a recurrence of a similar calamity, 160.
Hindostan, agriculture of, No. III., 317.
Home-made bread, 583.
Honey-dew, its nature shewn, 499.

Indigo, as grown in Hindostan, 327—cultivation of it described, 328—cutting the plant, 331—stowing, ib.—fermentation, 332—beating, ib.—settling, ib.—filtering, 333—cakes of, 334—extent of its cultivation, 335—value and imports of, 336.
Insects most injurious to vegetables and animals, and the means best calculated to counteract their ravages, No. III., weevils, 1—No. IV., weevils continued, 394—in provisions, 458—No. V., lamellicorn and longicorn beetles, 565.
Inverness-shire, fiar prices of, for crop and year 1837, 158.
Italian rye-grass—its durability considered, 597.

Johnson, George W., Esq., on the diseases incident to the most usually cultivated plants, smut, 45—mildew, or rust, 253—extravasated sap, and honey-dew, 496.

Kilkenny, on the agriculture of the county of, 475.
Kincardineshire, fiar prices of, for crop and year 1837, 158.
Kinross-shire, fiar prices of, for crop and year 1837, 158.
Kirkcudbrightshire, fiar prices of, for crop and year 1837, 158.
Knox, Dr, his anatomical examination of the wild ox of Scotland, with some remarks on its natural history, 367.
Kohl-rabi, its culture recommended, 93.

Lanarkshire, fiar prices of, for crop and year 1837, 158.
Lawson, Mr John, jun., Elgin, on the structure of smut-balls in wheat, 269.
Limestone, method of burning it in Ireland described, 216.
Liniment for the galled backs of horses, 299.

Linlithgowshire, fiar prices of, for crop and year 1837, 158.
Liquors, strength of various, 311.
Liverpool, prices of grain at, from February 2. to April 27. 1838, 155—4th May to 27th July 1838, 315—3d August to 26th October 1838, 474—2d November 1838 to 25th January 1839, 615.
London, prices of grain at, from February 2. to April 27. 1838, 155—4th May to 27th July 1838, 315—3d August to 26th October 1838, 474—2d November 1838 to 25th January 1839, 615.
Loudon, J. C., his Arboretum Britannicum reviewed, 55—his Suburban Gardener reviewed, 452.
Loy and Stiveen, implements used in Ireland, described, 218.
Lucerne and saintfoin, their culture recommended, 95.
Lyon's treatise on trees reviewed, 301.

M'Culloch, Mr Niel, his tables for measuring land explained, 600.
Macgregor, Mr Alexander, Kilmuir, Skye, on the causes of the destitution of food in the Highlands and Islands of Scotland in the years 1836 and 1837, 160.
Madden, Mr Henry R., on agricultural chemistry, 123, 226, 421, 546.
Menteath, James, Esq. of Closeburn, his pamphlet entitled Farmers *v.* Rooks, reviewed, 464.
Mildew or rust, its history and character described, 253—its cure in wheat effected by the application of salt, 267—proofs that the barberry produces it in wheat, 595.
Miscellaneous notices: Proposed new Museum of the Highland and Agricultural Society of Scotland, 305—manufacture of cheese from potatoes, 310—importation of cattle into France, ib.—geese as barometers, 311—improvement in glass, ib.—acoustic telegraph, ib.—strength of liquors, ib.—galvanic telegraph, ib.
Mole-plough, a description of, 391.
Morpeth, prices of butcher-meat at, from February to April 1838, 156—May to July 1838, 316—August to October 1838, 473—November 1838 to January 1839, 614.
Moss, its growth and nature described, 353—as a weed infesting grass land, 357—its extirpation, 362—conclusions regarding it as an injurer of grass, 365.

Nairnshire, fiar prices of, for crop and year 1837, 158.
New Museum of the Highland and Agricultural Society of Scotland, 305.

Orkneyshire, fiar prices of, for crop and year 1837, 158.
Ox, anatomical examination of the wild one in Scotland, with some remarks on its natural history, 367; tribe, in connexion with the white cattle of the Chillingham and Hamilton breeds, 514.

Patrick, Rev. W., of Hamilton, on the ox tribe, in connexion with the white cattle of the Chillingham and Hamilton breeds, 514.
Pauperism, on the increase of, in Scotland, 534.
Pearson, Mr John, on the proper management of farm-yard manure, 299.
Peeblesshire, fiar prices of, for crop and year 1837, 158.
Perthshire, fiar prices of, for crop and year 1837, 158.
Plants, on the diseases incident to the most usually cultivated, No. IV. Smut, 45—No. V. Mildew or rust, 253—No. VI. Extravasated sap, honey-dew, 496.
Poa nervosa, 299.
Potato-failure, Mr Gorrie's theory of it defended, 78.
Potatoes, their earthing up deprecated, 77—strictures on the culture of, 106—effects of successive crops of described, 293—curl in them, how prevented, 296—manufacture of cheese from, 310—the culture of, 337.
Pulverisation of soil, effects of, 469.

Quarterly agricultural report, May 1838, 154—August 1838, 312—November 1838, 469.

Rabbit-warren, the construction of a domestic one described, 30.

Railways, their effects on agriculture considered, 68.
Renfrewshire, fiar prices of, for crop and year 1837, 158.
Retrospect of the British and Foreign corn trade for crop 1837 given, 134.
Revenue for quarter and year ending 5th April 1838, 157—5th July 1838, 314—5th October 1838, 472—5th January 1839, 616.
Roberton, Mr James, Ladyrig, Roxburghshire, account of his drain-filling harp, 456.
Rooks proved to be destructive to crops, 464.
Roscommon, on the agriculture of the county of, 200.
Ross and Cromarty shires, fiar prices of, for crop and year 1837, 158.
Roxburghshire, fiar prices of, for crop and year 1837, 158.
Rust. See Mildew.

Salt, its application effects the cure of mildew in wheat, 267.
Scotland, increase of pauperism in, 534.
Selkirkshire, fiar prices of, for crop and year 1837, 158.
Shrubs, their destruction by the severe winter of, 1837, explained, 114.
Small-pox, its prevalence deprecated, 283.
Smithfield, prices of butcher-meat at, from February to April 1838, 156—May to July 1838, 316—August to October 1838, 473—November 1838 to January 1839.
Smut, its nature, causes, and prevention described, 45—the structure of smut balls in wheat described, 269—best and safest wash against, 297.
Soils, their chemical nature and composition described, 129—effects of their pulverisation, 469.
Stable-economy, a treatise of that name, reviewed, 118.
Stewart, Mr J., his treatise on stable-economy reviewed, 118.
Stirlingshire, fiar prices of, for crop and year 1837, 158.
Studies in agriculture, No. III. weeds, moss in lawns and pastures, 353.
Subsoil ploughing, thoughts on, 410—on its misapplication, 589.
Suburban Gardener reviewed, 452.
Sutherlandshire, fiar prices of, for crop and year 1837, 158.

Tanks, a good construction of them described, 23.
Taylor, Mr Wm., his tables for reducing the quantity of wheat to the standard of 60 lb. per bushel explained, 599.
Tea as grown in China, 322.
Telegraph, acoustic, 311—galvanic, ib.
Thoughts on draining, as a subject of compact betwixt landlord and tenant, 221 — on subsoil-ploughing, 410.
Thrashing-machines, improvements in them suggested, 64.
Tile-soles recommended to be always used in tile-draining, 225.
Timber, on measuring growing, 242.
Tobacco, as grown in Hindostan, 317.
Towers, Mr, on haymaking, 35—on the ægrostis segetum, 89—on kohl rabi, 93—on lucerne and saintfoin, 95—on the culture of the potato. 337—some of his experiments on its culture described, 350.
Trees, Lyon's treatise on, reviewed, 301—simple method of carrying for transplantation, 457.
Tups, their artificial dressing and feeding for sale, deprecated, 87.
Turf or peat, method of carrying, and prices of which in Ireland, stated, 206.
Turn-wrest ploughs, remarks on, 450.
Turnbull, Mr George, his pamphlet on the increase of pauperism in Berwickshire, reviewed, 534.

Vaccination in Paris, 288.
Ventillation of dwelling-houses, plan of described and recommended, 278.

Water, its uses and abuses described, 19.
Weevils, their destructive properties described, and means for counteracting their ravages suggested, 1, 394.
Wigtonshire, fiar prices of, for crop and year 1837, 158.
Wool, prices of English and Scotch, 156, 316, 473.

Yeast. See Barm.

PRINTED BY NEILL AND CO., OLD FISHMARKET, EDINBURGH.

2681 (12

THE LIBRARY OF CONGRESS

THE LIBRARY OF CONGRESS

LIBRARY OF CONGRESS

00026913524